



Naval Facilities Engineering Systems Command Southwest
BRAC PMO West
San Diego, CA

Final Summary Report, Radiological Object Recovery

Parcel C Radiological Confirmation Sampling and Survey

Hunters Point Naval Shipyard, San Francisco, California

September, 2024

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FINAL SUMMARY REPORT, RADIOLOGICAL OBJECT RECOVER
PARCEL C RADIOLOGICAL CONFIRMATION SAMPLING AND SURVEY
HUNTERS POINT NAVAL SHPYARD, SAN FRANCISCO CA

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1.0 Introduction

This Summary Report contains information pertaining to the recovery of a deck marker containing radium-226 (radiological object) at Hunters Point Naval Shipyard (HPNS) Parcel C in San Francisco, California on 24 August 2023. The report and appendices provide a summary of the fieldwork procedures, data collection and analysis, health and safety measures, and third-party Quality Assurance (QA) oversight performed during the recovery of the radiological object. The report establishes that a workplan was created in conjunction with regulatory agencies, the workplan procedures were followed resulting in the recovery of a discrete radiological object, and that adherence to the workplan requires 100 percent re-excavation of Phase 2 Trench Units (TU's) at Parcel C. All procedures outlined in this document are in accordance with the multi-agency approved *Final Parcel C Removal Site Evaluation Work Plan, Hunters Point Naval Shipyard, San Francisco, California* (Gilbane, 2022).

The subsections of the report are organized in sequential order. Section 2.0 - Project Overview provides a summary of the overall investigative approach to the radiological "re-work" at Parcel C. Section 3.0 - Radiological Object Recovery Process details the fieldwork and sampling procedures performed pre and post object recovery. Section 4.0 - Project Data Quality Objectives defines the data evaluation and decision-making processes in accordance with the Parcel C Workplan. Section 5.0 - Basis for Decision to Re-excavate Phase 2 Trench Units (TU's) identifies the decision-making criteria involved in determining that based on the radiological object recovery, in consultation with regulatory agencies, the Navy will conduct the re-excavation and characterization of 100 percent of the remaining soil in trench units at Parcel C.

This report was prepared by Naval Facilities Engineering System Command Southwest under Contract Number N62473-17-D-0005 (RADMAC II), CTO# N62473-18-F-5305, with GES, an ASRC Industrial Company (GES).

2.0 Project Overview

This section is intended to provide the Parcel C Radiological "re-work" Project Overview. The project is performed in compliance with the multi-agency approved *Final Parcel C Removal Site Evaluation Work Plan, Hunters Point Naval Shipyard, San Francisco, California* (Gilbane, 2022) hereto by referred to as the Parcel C Workplan.

The Parcel C Workplan was developed in order to ensure that the goals in the Parcel C ROD (Record of Decision) RAO (Remedial Action Objective) for soil can be met. In order to achieve a high level of confidence that the Parcel C ROD RAO can be met for soil, a two-phase investigation approach was designed for trench units (TUs) associated with the former sanitary sewers and storm drains in Parcel C, as agreed upon by the Navy and regulatory agencies. Phase 1 includes the re-excavation and characterization of 100 percent of the soil in a targeted group of one-third (23 of the 69) of the TUs. This one-third of the TUs was selected through a cooperative process between the Navy and regulators and based on the highest potential for radioactive contamination. Phase 2 consists of subsurface soil samples collected via borings to be drilled within and along the sidewalls of the remaining two-thirds (46 of 69) of the TUs. Per

the cooperative workplan design, 100 percent of Phase 2 TUs will be re-excavated if contamination (i.e., exceedance of the remediation goal [RG] that is not attributable to naturally occurring radioactive material [NORM] or anthropogenic background) is identified in any of the Phase 1 TUs. The Parcel C RG for ^{226}Ra , in picocuries per gram (pCi/g), is shown below:

Soil Remediation Goals from Parcel C ROD

Radionuclide	Residential Soil Remediation Goal ^a (pCi/g)
^{226}Ra	1.0 ^b

Notes:

^a All RGs will be applied as stated in the Parcel C ROD. Analytical results also will be compared to background values.

^b ^{226}Ra RG is 1 pCi/g above background

On August 24, 2023, radioactive contamination in the form of a discrete radioactive object was identified and recovered from soil excavated from a Phase 1 TU. Subsection 3.0 and the appendices contain detailed information on this recovery. Based on the recovery and per the Parcel C workplan, the Navy will now conduct the re-excavation and characterization of 100 percent of the soil in the remaining 46 of 69 TUs identified as Phase 2.

The two-phase approach designed for Parcel C is described in the *FINAL Parcel C Removal Site Evaluation Work Plan, Hunters Point Naval Shipyard, San Francisco, California* (Gilbane, 2022). For Phase 1 TUs, the soil is excavated to the original TU boundaries, as practicable. An additional approximately six inches of soil is removed from the trench sidewalls and floors, and kept separate from the main trench soil throughout the screening process. The excavated soil is moved to a radiological screening yard (RSY) and laid out on RSY pads. A gamma scan survey is conducted over 100 percent of the soil. Soil samples are collected from locations systematically spaced across each pad. In addition, soil samples are collected from biased locations of interest identified by the gamma scan data. For Phase 2 TUs, if no Phase 1 contamination above the RGs was detected, a gamma scan survey of 100 percent of accessible surface areas would be conducted, and subsurface soil samples collected via borings placed within and along the sidewalls of the TU. The borings would be advanced 6-inches beyond the floor boundary of the TU or to the point of refusal. Soil samples would then be analyzed for the radionuclides of concern by an accredited off-site laboratory.

The re-excavation and characterization of soil in Phase 1 TUs in Parcel C began on 2 February 2023. At the time of the discovery of the radioactive object, work was underway on six of the 23 Phase 1 TUs scheduled for re-excavation, with 7,792 cubic yards of 20,445 cubic yards (38.11%) of soil having been re-excavated. Work on the remaining 46 Phase 2 TUs is not scheduled to start until work on the Phase 1 TUs is complete.

3.0 Radiological Object Recovery Process at Parcel C

This section is intended to detail the fieldwork and sampling procedures performed pre and post radiological object recovery. All of the following activities were performed in compliance with the Parcel C Workplan.

On 24 August 2023, at approximately 1030 hours Pacific Time, a radiological anomaly was detected by the Navy's contractor, GES. The radiological anomaly was detected with a towed Radiation Solutions, Inc. RS-700 mobile gamma-ray detection system while driving over a radiological screening yard (RSY) pad unit of soil from trench unit TU-315 in Parcel C at Hunters Point. The area around the radiological anomaly was delineated and secured. At 1042 hours, hand-held radiological detection equipment was used to confirm the anomaly. At 1118 hours the Navy Base Realignment and Closure Program Management Office (BRAC PMO) was alerted of the discovery of the radiological anomaly via phone call from GES. The initial phone call from GES to BRAC PMO was followed by additional contractor and Navy RPM notification calls to the Navy Resident Officer In Charge of Construction (ROICC), Caretaker Site Office (CSO), and the Navy 3rd Party radiological oversight contractor (Battelle).

According to GES trench excavation data, the soil from trench unit TU-315 was excavated and placed on the RSY pad between 12 April 2023 and 09 May 2023. Each RSY pad in Parcel C only contains soil from a single trench unit. Each individual truck load is tracked and logged from the point of excavation to each individual RSY pad. According to GES excavation trucking and tracking logs, the radiological object originated in TU-315.

At 1235 hours, in the presence of ROICC and Battelle representatives, GES staged polyvinyl sheeting next to the location to prepare for item retrieval. Shallow lifts of soil were to be removed until the item was located. GES personnel loosened and removed the first lift (the top two inches) of soil with a shovel. An object identified as a deck marker with radioluminescent paint was observed/identified within the first scoop of soil removed. The deck marker was observed to be approximately 1.5 to 2 inches in diameter, did not appear to be broken or corroded, and was found lying flat within the soil with the painted side facing up (Appendix A). Static gamma counts and dose rate readings were collected from the deck marker at contact and from a distance of thirty centimeters. The results are summarized below in the table below and in Appendix A. GES Radiological Technicians ensured the deck marker was bagged, labeled, and placed into a lead-lined safe within a secured GES site trailer under the supervision of the Navy ROICC.

Radiological Object Field Measurements	
<u>Gamma Static Counts</u>	<u>Dose Rates</u>
1,348,930 CPM on Contact	1200uR/hr on contact
16,161 CPM @ 30 cm	32uR/hr @ 30 cm

Notes:
 cm = centimeters
 CPM = counts per minute
 uR/hr = microRoentgen per hour

A Fact Sheet was disseminated to the public on 28 August 2023 displaying the location of the object recovered in addition to any pertinent information for the community. This Fact Sheet is located in Appendix B.

Following removal of the object, soil was investigated and removed to a distance of roughly two feet in each direction, and bounding samples were collected on 6 September 2023 to confirm that all potential radiological contamination was removed from the area. The bounding sample

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results can be found in Appendix A. No activity above the Parcel C Workplan established release criteria was detected in the bounding samples.

The radiological object was received by the the lab on 01 March 2024 for analysis. The lab analytical data were received on 22 March 2024 and are provided in Appendix F. The analysis confirmed the radiological object contained levels of ^{226}Ra above the project remedial goal.

Additional data review by GES, the Navy, and third party QC contractor was performed following the object recovery and associated sampling. The table below displays the timeline of events in relation to the radiological object recovery at Parcel C.

Chronology of Events	
<u>Date(s)</u>	<u>Events</u>
12 April 2023 – 09 May 2023	TU-315 Excavated
24 August 2023	ESU-315 Gamma Drive-Over Performed
24 August 2023	RSY Pad Investigation and Object Recovery Performed
28 August 2023	Public Notified of Parcel C Rad Object via Parcel C Rad Object Fact Sheet (Appendix B)
6 September 2023	RO-01 bounding samples and ESU-315A systematic/biased soil samples collected
3 October 2023	Validated RO-01 bounding sample results received
18 October 2023	Validated ESU-315A systematic/biased soil sample results received
01 March 2024	Parcel C radiological object received by lab
22 March 2024	Parcel C radiological object lab results received
19 October 2023 – Present	Navy Data Review and Parcel C Radiological Object Reporting Performed

4.0 Project Data Quality Objectives

This section is intended to define the data evaluation and decision-making processes reviewed by the Navy, in accordance with the Parcel C Workplan.

The project data quality objectives (DQOs) for the Phase 1 soil investigation are found in the Parcel C Work Plan, Section 3.1, and are summarized below.

Step 1-State the Problem: Data manipulation and falsification committed by a contractor during past sanitary sewer and storm drain removal actions call into question the reliability of soil data. There is uncertainty whether radiological contamination was present or remains in place.

Step 2-Identify the Objective: The primary objective of the soil investigation is to determine whether site conditions are compliant with the Parcel C ROD RAO.

Step 3-Identify Inputs to the Objective: The inputs include surface soil and subsurface soil analytical data for the applicable ROCs and gamma scan measurements to identify biased soil sample locations.

Step 4-Define the Study Boundaries: The Phase 1 and Phase 2 TUs are listed in the Parcel C Work Plan Tables 3-1 and 3-2, and are shown on Figure 3-1.

Step 5-Develop Decision Rules: If the investigation results demonstrate exceedances of the RGs determined from a point-by-point comparison with the RGs and are not shown to be NORM or anthropogenic background, remediation will be conducted. Remediation will be based on the following:

- If one Phase 1 TU does not meet the Parcel C ROD RAO, all Phase 2 TUs will be excavated.
- If all Phase 1 TUs meet the Parcel C ROD RAO, Phase 2 will be initiated for TUs.

Step 6-Specify the Performance Criteria: The data will be evaluated by comparing each ROC concentration for every sample to the corresponding RG.

- If all concentrations for all ROCs for all samples are less than or equal to the RGs, then compliance with the Parcel C ROD RAO is achieved.
- If any result is greater than the RG and cannot be attributed to NORM or anthropogenic background, remediation will be performed prior to backfilling.

Step 7-Develop the Plan for Obtaining Data: The radiological investigation will be conducted on a targeted group of 23 of the 69 TUs associated with former sanitary sewers and storm drains in Parcel C.

- Soil will be excavated to the original TU boundaries, as practicable.
- Additional excavation of approximately 6 inches of the trench sidewalls and floors will be performed to provide ex-situ gamma scanning and sampling of the trench sidewalls and floors.
- Excavated soil will be 100 percent gamma scanned by laying it out on RSY pads.
- Systematic and biased samples will be collected from the excavated soil for off-site analysis.
- The soil samples collected will be analyzed for the applicable ROCs by accredited off-site laboratories and the results will be evaluated as described in Step 6.
- If contamination is found during Phase 1, then all of the Phase 2 TUs will be excavated and investigated in a manner exact to the Phase 1 TUs.

5.0 Basis for Decision to Re-Excavate Phase 2 TUs

This section identifies the decision-making criteria involved in determining that based on the radiological object recovery, in consultation with regulatory agencies, the Navy will conduct the re-excavation and characterization of 100 percent of the remaining soil in trench units at Parcel C.

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The purpose of the Parcel C radiological investigation is to determine whether site conditions are compliant with the Parcel C ROD RAO, which, for radiologically impacted soil, is to prevent receptor exposure to radionuclides of concern at concentrations that exceed the RG for all potentially complete exposure pathways. These pathways include exposure to external radiation. The Parcel C DQOs, specifically Step 3, identify as inputs to the DQOs not only surface soil and subsurface soil analytical data, but also gamma scan measurements. While the DQOs are focused primarily on soil, they clearly encompass site conditions, such as the presence of discrete radioactive objects, where receptor exposure to radionuclides of concern may occur at concentrations that exceed the RG. For example, the Parcel C Work Plan, Section 3.3.1, explains that areas of elevated activity identified during gamma scan surveys “...*may result in the collection of biased samples or additional field measurements to determine the areal extent of the elevated activity. Potential causes of elevated gamma scan measurements may include discrete radioactive objects (e.g., deck markers), localized soil contamination, measurement geometry effects, and NORM.*”

The Parcel C DQOs, specifically Step 5, states that 100 percent of Phase 2 TUs will be re-excavated if contamination (i.e., exceedance of the RG that is not attributable to NORM or anthropogenic background) is identified in Phase 1 TUs. Lab analysis of the discrete radioactive object reported radioactivity in exceedance of the RG that cannot be attributed to NORM or anthropogenic background (See below and Appendix F).

Soil Remediation Goals from Parcel C ROD

Radionuclide	Residential Soil Remediation Goal ^a (pCi/g)	Parcel C Object Analytical Results (pCi/g)
²²⁶ Ra	1.0 ^b	60,000

Notes:

^a All RGs will be applied as stated in the Parcel C ROD. Analytical results also will be compared to background values.

^b ²²⁶Ra RG is 1 pCi/g above background

Therefore, based on the discovery of contamination (i.e., the deck marker containing radium-226) in a Phase 1 TU (TU 315), the re-excavation and characterization of 100 percent of the soil in the remaining 46 of 69 TUs identified as Phase 2 is required.

6.0 Appendices

A. HPNS Parcel C Radiological Object - GES

B. HPNS Parcel C Fact Sheet

C. HPNS Parcel C Phase I Daily Production Report for 08.24.23 – GES Report

D. HPNS Parcel C Radiological Rework – 3rd Party QA Report 08.24.23

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E. HPNS Parcel C Radiological Investigation and Survey – ROICC Daily Report 08.24.23

F. Parcel C Radiological Object Laboratory Results

7.0 References

Final Removal Site Evaluation Work Plan Radiological Investigation, Survey, and Reporting at Parcel C, Hunters Point Naval Shipyard, San Francisco, California

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APPENDIX A

HPNS PARCEL C RADIOLOGICAL OBJECT - GES

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PARCEL C RADIOLOGICAL CONFIRMATION SAMPLING AND SURVEY
HUNTERS POINT NAVAL SHPYARD, SAN FRANCISCO CA

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20 December 2023

Submitted via Email

Mr. Sean-Ryan McCray
Remedial Project Manager
Navy BRAC PMO West
33000 Nixie Way, Building 50
San Diego CA 92147

Subject: Discovery of Radiological Object - Radiological Confirmation Sampling and Survey at Parcel C, Hunters Point Naval Shipyard, San Francisco, California
Contract Number N62473-17-D-0005 (RADMAC II), CTO# N62473-18-F-5305

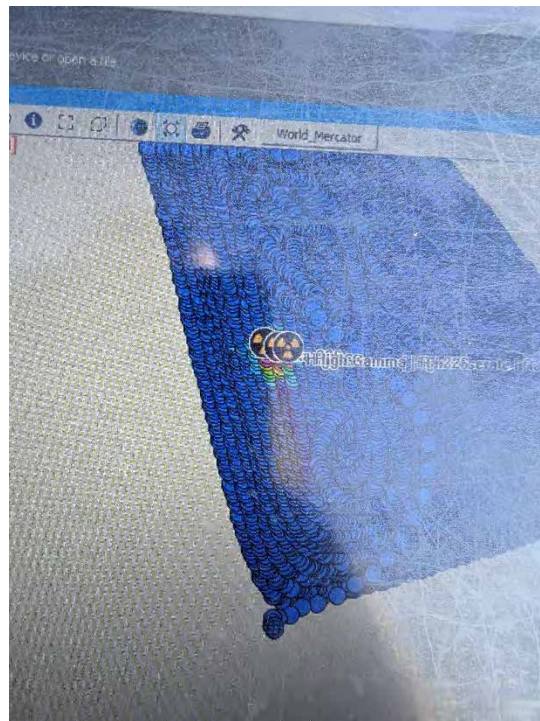
Dear Mr. McCray:

On 24 August 2023, at approximately 1030 hours Pacific Time, a radiological anomaly was detected with a towed Radiation Solutions, Inc. RS-700 mobile gamma-ray detection system while driving over a unit of soil from trench TU-315 in Parcel C at Hunters Point. The area was delineated/secured and at 1042 hours hand-held radiological detection equipment was used to confirm the anomaly. At 1118 hours the Navy BRAC PMO office was alerted to the discovery via phone call, followed by calls to the Navy Resident Officer In Charge of Construction (ROICC), Caretaker Site Office (CSO), and the Navy 3rd Party radiological oversight contractor (Batelle).

Soil from TU-315 was excavated between 12 April and 09 May 2023. At the time of completion of TU-315 excavation, 4,541 cubic yards of an expected 20,445 yards to be completed under the project (22.21%) had been excavated. As of 24 August 2023, 7,792 cubic yards of 20,445 cubic yards (38.11%) have been excavated.

At 1235 hours, in the presence of ROICC and Batelle representatives, GES staged polyvinyl sheeting next to the location to prepare for item retrieval. Shallow lifts of soil were to be removed until the item was located. GES personnel loosened and removed the top two inches of soil with a shovel. A deck marker was detected in the first scoop of soil removed. The marker was approximately 1.5 to 2 inches in diameter, did not appear to be broken or corroded, and was found lying flat within the soil with the painted side facing up. Static gamma counts and dose rate readings were collected from the object at contact and from a distance of thirty centimeters. The results are below. The object was bagged, labeled, and placed into a lead-lined safe within a secured GES site trailer.

Gamma Static Counts	Dose Rates
1,348,930 CPM on Contact	1200uR/hr on contact
16,161 CPM @ 30 cm	32uR/hr @ 30 cm



RS-700 Drive Over Map with Anomalies



Static Gamma Count at Surface



Static Gamma Count Result at Surface



Dose Rate Reading at Surface



Loosening of 2-Inch Soil Layer



Removal of 2-Inch Soil Layer



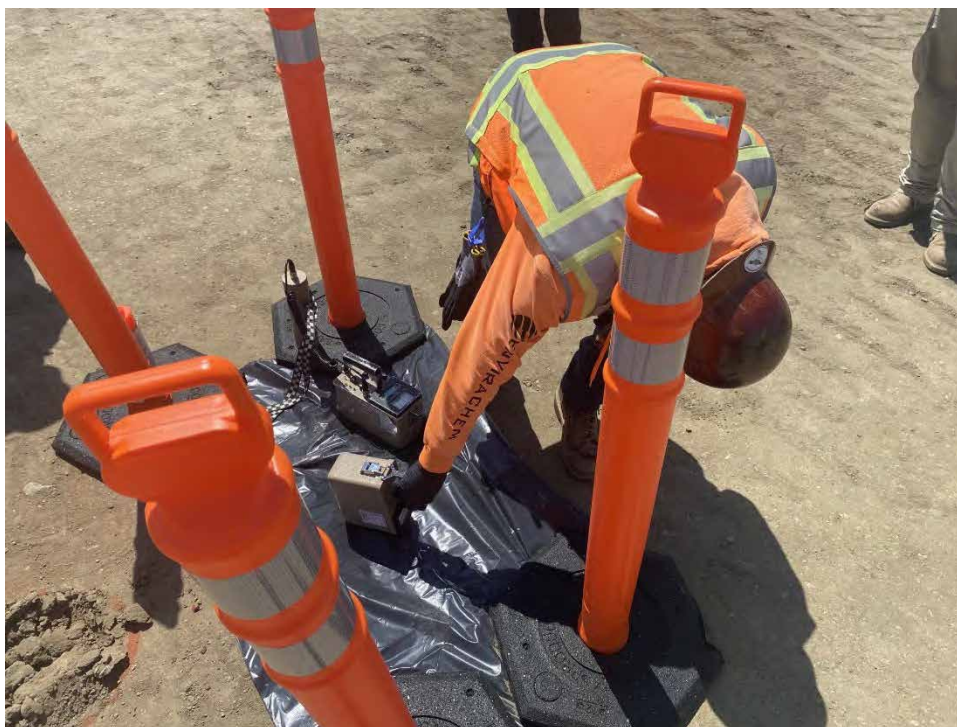
Device Located in First Scoop of Soil



Position of Object as Found in Soil



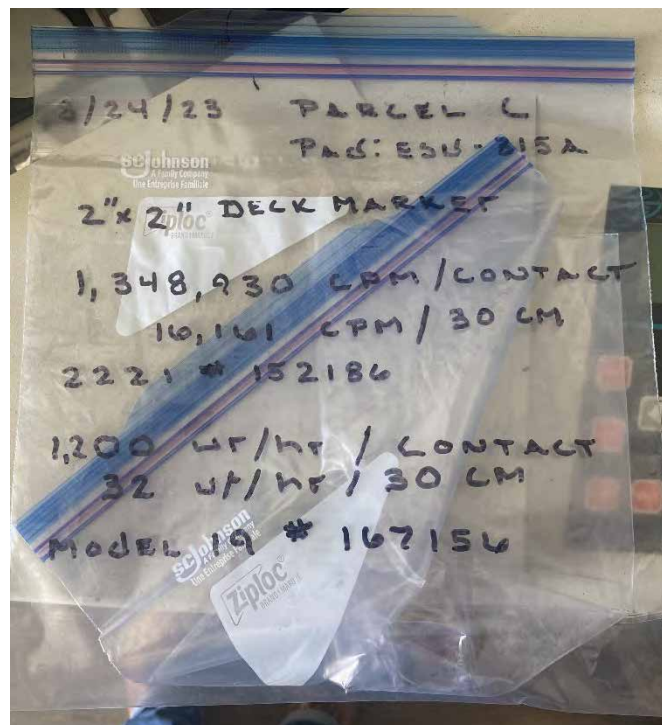
Gamma Static Count on Contact



Dose Rate Reading on Contact



Dose Rate Reading at 30 cm



Bagged Object



Following removal of the object, soil was removed to a distance of roughly two feet in each direction, and bounding samples were collected on 6 September 2023 to confirm that all contamination was removed. Results of these samples are attached. No activity above the release criteria was detected.

We will provide additional information as it arises. If you have any questions or require additional information, please contact the undersigned at your earliest convenience.

Sincerely,

A handwritten signature in black ink, appearing to read 'Brett Womack', followed by a long, horizontal, wavy line that extends to the right.

Brett Womack
Project Manager
925-250-8027
bwomack@ges-ais.com

ARS1-23-01973 Results

SDG	Matrix	Location ID	Sample ID	Lab Sample ID	Sample Date	Unit	Cs-137			Ra-226			Sr-T		
							Result	Remediation Goal (RG)	Result exceeds RG (Y/N)	Result	Remediation Goal (RG)	Result exceeds RG (Y/N)	Result	Remediation Goal (RG)	Result exceeds RG (Y/N)
ARS1-23-01973	SO	HPPCESU-315A031	HPPC-ESU-315A-031	ARS1-23-01973-001	9/6/2023 10:20:00 AM	PCI/G	-0.021	0.113	N	0.394	1.861	N			
		HPPCESU-315A032	HPPC-ESU-315A-032	ARS1-23-01973-002	9/6/2023 10:23:00 AM	PCI/G	0.013	0.113	N	0.336	1.861	N			
		HPPCESU-315A033	HPPC-ESU-315A-033	ARS1-23-01973-003	9/6/2023 10:30:00 AM	PCI/G	0.009	0.113	N	0.301	1.861	N	-0.004	0.331	N
			HPPC-ESU-315A-033-FD	ARS1-23-01973-004	9/6/2023 10:30:00 AM	PCI/G	0.003	0.113	N	0.354	1.861	N	0.13	0.331	N
		HPPCESU-315A034	HPPC-ESU-315A-034	ARS1-23-01973-005	9/6/2023 10:35:00 AM	PCI/G	-0.005	0.113	N	0.365	1.861	N			



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ARS Aleut Analytical, LLC

Laboratory Analytical Report

ARS1-23-01973

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COC Number: **090623P13302**

Job Number: **J310000600**

Job Location: **Hunters Point Shipyard, Parcel C Removal Site Evaluation**

Project Name: **Work Area 33 Phase 1**

Questions regarding this analytical report should be addressed to ARS project manager, Abigail Hoover, who can be reached by email at projectmanagers@aaa.aleutfederal.com.

I certify that the test results presented in this report (in either hardcopy or electronic file (EDD)) meet the requirements of the laboratory's certifications and other applicable contract terms and conditions. A full list of the Port Allen, LA laboratory's certifications is provided with this report. Any exceptions to the certification or contract will be noted within the case narratives presented in the report. Any subcontracted sample results will be identified within the case narratives presented in the report. In the event this report is an amendment to a previously released report, the case narrative will clearly identify the original report as well as the reason(s) for reissuance. A statement of uncertainty for each analysis is available upon request. I authorize release and issuance of this report on the date signed below.

Laboratory Management, ARS Aleut Analytical

Signature

Date

Title

This report provides analytical results of the requested analysis and does not include any opinions or interpretations. ARS Aleut Analytical, LLC assumes no liability for the use or interpretation of analytical results. Results relate only to items tested. A partial reproduction of this test report is prohibited. Reproduction of this report in full requires the written approval of the laboratory.





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Certifications and Accreditations List

State or Accrediting Body (AB)	Certificate Number
AIHA LAP, LLC	209312
Alaska	LA01131
California	3085
ANAB DoD	ADE-1489
ANAB DOE	ADE-1489.01
Louisiana DEQ - NELAC	01949
Louisiana DHH	LA022
Nevada	LA011312024-02
New Jersey	LA009
New York	66780 (NPW) / 66781 (SHW)
Texas	T104704447-22-18
Utah	LA011312023-14
Washington	C1010

For additional information related to the specific matrices, methods, and analytes recognized by each accrediting body, contact us at QA@aaa.alutefederal.com for additional information.



ARS Aleut Analytical, LLC Analytical Reports

for

GES-AIS, LLC

Case Narrative



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**PROJECT SAMPLE IDENTIFICATION
CROSS-REFERENCE
TO ARS SAMPLE LABORATORY IDs**

Client Sample ID	ARS Aleut Analytical Sample ID
HPPC-ESU-315A-031	ARS1-23-01973-001
HPPC-ESU-315A-032	ARS1-23-01973-002
HPPC-ESU-315A-033	ARS1-23-01973-003
HPPC-ESU-315A-033-FD	ARS1-23-01973-004
HPPC-ESU-315A-034	ARS1-23-01973-005

Sample	Date Collected	Date Received	Analysis	Basis	Prep Date/Time	Analysis Date/Time
001	09/06/23 10:20	09/07/23	GAM-IG21-SO	Dry	09/08/23 09:50	09/29/23 09:24
002	09/06/23 10:23	09/07/23	GAM-IG21-SO	Dry	09/08/23 09:50	09/29/23 09:25
003	09/06/23 10:30	09/07/23	GAM-IG21-SO	Dry	09/08/23 09:50	09/29/23 10:28
003	09/06/23 10:30	09/07/23	GPC-SR90-SO	Dry	09/12/23 07:27	09/13/23 11:09
004	09/06/23 10:30	09/07/23	GAM-IG21-SO	Dry	09/08/23 09:50	09/29/23 10:29
004	09/06/23 10:30	09/07/23	GPC-SR90-SO	Dry	09/12/23 07:27	09/13/23 11:09
005	09/06/23 10:35	09/07/23	GAM-IG21-SO	Dry	09/08/23 09:50	09/29/23 11:33

SAMPLE RECEIPT/PREP

The samples arrived in good condition. The samples were screened for radioactive contamination as per procedure **PALA-SR-001-SOP Sample Receiving**. Sample date(s) and time(s) are listed as provided by the client. Per client, samples 001, 002, 003, 004, and 005 underwent 21 day ingrowth prior to gamma spec analysis. Turnaround time was set at 28 calendar days.

ANALYTICAL METHODS

Cs-137 and Ra-226 analyses were performed using **PALA-RAD-007, "Modified Gamma Emitting Radionuclides in Soil, Air, and Biota Matrices (EPA 901.1 Mod, SM 7120B, & HASL-300 Ga-01-R)"**.

Sr-90 analysis was performed using **PALA-RAD-032, "Strontium 89, 90 and Total Strontium in Water, Soil and Vegetation Matrices by Eichrom Resin Separation (Eichrom SRW01, EPA 905.0, HASL 300 Sr-01-RC)"**.



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ANALYTICAL RESULTS

Batch ARS1-B23-01624: DUP and/or parent sample value(s) for SR-90 are below the MDA, RPD is not applicable.

Batch ARS1-B23-01775: DUP and/or parent sample value(s) for Cs-137 are below the MDA, RPD is not applicable.

For batch ARS1-B23-01624, sample “HPPC-ESU-315A-033” (ARS1-23-01973-003) was used as the Sample Duplicate.

For batch ARS1-B23-01775, sample “HPPC-ESU-315A-034” (ARS1-23-01973-005) was used as the Sample Duplicate.

Notes (Case Narrative)

Definitions:

CRDL	Contract Required Detection Limit
CSU	Combined Standard Uncertainty
DLC	Decision Level Concentration (ANSI N42.23)
DO	Duplicate Original
DUP	Sample Duplicate
LCS/LCSD	Laboratory Control Sample/Laboratory Control Sample Duplicate
LOD	Limit of Detection
LOQ	Limit of Quantitation
MBL	Method Blank
MCL	Maximum Contaminant Level
MDA	Minimum Detectable Activity
MDL	Method Detection Limit
MS/MSD	Matrix Spike/Matrix Spike Duplicate
N/A	Not Applicable
NC	Not Calculated
NP	Not Provided
NR	Not Referenced
PQL	Practical Quantitation Limit

Data Qualifiers:

B	The result of both the method blank and the target sample are above the MDL.
D	Sample analysis accomplished through dilution.
J	The reported result is an estimated value above the LOD but below the LOQ, or above the MDL but below the PQL.
Q	One or more quality control criteria failed.
U	Result is below the MDA, MDL, PQL, LOD, or LOQ
*	LCS/LCSD or Sample DUP fails all Duplicate criteria.
S	Spike
SC	Subcontracted out to another qualified laboratory.
H	Holding time exceeded
E	Exceeds MCL
**	Reporting Limit is higher than MCL; Target cannot be detected
‡	Method/Matrix/Analyte not accredited for this certification

Radiochemistry Comments:

- 1.0) All MDA/MDC values are calculated on a sample specific basis.
- 2.0) Data in this report are within the limits of uncertainty specified in the reference method unless otherwise specified.
- 3.0) Total activity is actually total gamma activity and is determined utilizing the prominent gamma emitters from the naturally occurring radioactive decay chains and other prominent radioactive nuclides. Total activity may be lower than the actual total activity due to the extent of secular equilibrium achieved in the various decay chains at the time of analysis. The total activity is not representative of nuclides that emit solely alpha or beta particles.
- 4.0) Ra-226 after ingrowth is determined via secular equilibrium with its daughter, Bismuth 214 (Gamma Spectroscopy only).
- 5.0) Ra-228 is determined via secular equilibrium with its daughter, Actinium 228 (Gamma Spectroscopy only).
- 6.0) U-238 is determined via secular equilibrium with its daughter, Thorium 234 (Gamma Spectroscopy only).
- 7.0) All gamma spectroscopy was performed utilizing high purity germanium detectors (**HPGe**).
- 8.0) ARS makes every attempt to match sample density to calibrated density; however, in some cases, it is not practical or possible to do so and data results may be affected (Gamma Spectroscopy only).
- 9.0) Gamma spectroscopy results are calculated values based on the **ORTEC®** GammaVision ENV32 Analysis Engine.
- 10.0) DoD/DOE and ISO 17025 certifications through ANAB apply only to the following methods in **Non-Potable Water**:
Gross Alpha and Gross Beta (EPA 900.0, EPA 9310); Radium 226 (EPA 903.0, EPA 903.1, EPA 9315); Radium 228 (EPA 904.0, EPA 9320); ICP/MS (EPA 6020B); ICP-OES (EPA 6010D); Mercury CVAA (EPA 7470A); Strontium-89 (EPA 905.0, Eichrom SRW01, HASL 300 Sr-01); Strontium-90 (EPA 905.0, Eichrom SRW01, HASL 300 Sr-02-RC); Tritium (EPA 906.0); Enriched Tritium (ARS-040), Carbon-14 (ARS-019), Tritium/Carbon (ARS-151); Gamma Emitters (EPA 901.1, SM 7120B, HASL 300 Ga-01-R); Americium-241 (Eichrom ACW03, Eichrom ACW16, HASL 300 Se-03, HASL 300 Am-03); Neptunium 237 (Eichrom ACW16); Plutonium 238, Plutonium 239/240, Plutonium-241 (Eichrom ACW03, Eichrom ACW16, HASL 300 Se-03, HASL 300 Pu-10); Thorium-228, Thorium 230, Thorium-232 (Eichrom ACW10); Uranium-234, Uranium-235, Uranium-238 (Eichrom ACW03, Eichrom ACW16, HASL 300 Se-03); Technetium-99 (Eichrom TCW02)
- 11.0) DoD/DOE and ISO 17025 certifications through ANAB apply only to the following methods in **Solid and Chemical Materials**:
Gross Alpha and Gross Beta (EPA 900.0 Mod, EPA 9310); ICP/MS (EPA 6020B); ICP-OES (EPA 6010D); Mercury CVAA (EPA 7471B); Strontium-89 (EPA 905.0 Mod, Eichrom SRW01, HASL 300 Sr-01); Strontium-90 (EPA 905.0 Mod, Eichrom SRW01, HASL 300 Sr-02); Tritium (EPA 906.0 Mod); Gamma Emitters (EPA 901.1, HASL 300 Ga-01-R); Americium-241 (Eichrom ACW03, HASL 300 Se-03, HASL 300 Am-01-RC); Neptunium 237 (Eichrom ACW16); Plutonium 238, Plutonium 239/240, Plutonium-241 (Eichrom ACW03, Eichrom ACW16, HASL 300 Se-03, HASL 300 Pu-02-RC, HASL 300 Pu-03-RC); Thorium-228, Thorium 230, Thorium-232 (Eichrom ACW10); Uranium-234, Uranium-235, Uranium-238 (Eichrom ACW03, Eichrom ACW16, HASL 300 Se-03, HASL 300 U-02, HASL 300 U-04); Technetium-99 (Eichrom TCS01)
- 12.0) DoD/DOE and ISO 17025 certifications through ANAB apply only to the following methods in **Air and Emissions**:
Gross Alpha and Gross Beta (EPA 900.0 Mod, EPA 9310); Strontium-89 (Eichrom SRW01, HASL 300 Sr-01-RC); Strontium-90 (Eichrom SRW01, HASL 300 Sr-02-RC); Gamma Emitters (EPA 901.1, HASL 300 Ga-01-R); Americium-241 (Eichrom ACW03, HASL 300 Se-03); Neptunium 237 (Eichrom ACW16); Plutonium 238, Plutonium 239/240, Plutonium-241 (Eichrom ACW03, Eichrom ACW16, HASL 300 Se-03); Thorium-228, Thorium 230, Thorium-232 (Eichrom ACW10); Uranium-234, Uranium-235, Uranium-238 (Eichrom ACW03, Eichrom ACW16, HASL 300 Se-03); Technetium-99 (Eichrom TCW02, Eichrom TCS01)

General Comments:

- 1.0 Modified analysis procedures are procedures that are modified to meet certain specifications. An example may be the use of a water method to analyze a solid matrix due to the lack of an officially recognized procedure for the analysis of the solid matrix. Modified analyses are indicated by the subsequent addition of "M" or "Mod" to the procedure number (i.e. 901.1M, 901.1 Mod).
- 2.0 All NIOSH method results are reported without blank corrections applied.
- 3.0 Basis: "As Received" = analyzed as received from client; "Dry" = dried prior to being analyzed; "Dry Weight Corrected" = analyzed as received; result corrected for percent moisture.



ARS Aleut Analytical, LLC Analytical Reports

for

GES-AIS, LLC

Analytical Results



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(225) 228-1394

ARS Sample Delivery Group: ARS1-23-01973**Client Sample ID:** HPPC-ESU-315A-031**Sample Collection Date:** 09/06/23 10:20**Sample Matrix:** Soil/Solid/Sludge**Percent Solids:** %**Request or PO Number:** J310000600**ARS Sample ID:** ARS1-23-01973-001**Date Received:** 09/07/23**Report Date:** 10/02/23

Radiochemistry

Analysis Method: EPA 901.1M**ABatch Sample ID:** ARS1-B23-01775-04

Analysis Description	Analysis Results	CSU +/- 2 s	MDA	DLC	CRDL	Qual	Analysis Units	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Cs-137	-0.021	0.039	0.052	0.026	0.07	U	pCi/g	09/29/23 9:24	SDW	N/A
Ra-226	0.394	0.077	0.058	0.029	0.1		pCi/g	09/29/23 9:24	SDW	N/A



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ARS Sample Delivery Group: ARS1-23-01973**Client Sample ID:** HPPC-ESU-315A-032**Sample Collection Date:** 09/06/23 10:23**Sample Matrix:** Soil/Solid/Sludge**Percent Solids:** %**Request or PO Number:** J310000600**ARS Sample ID:** ARS1-23-01973-002**Date Received:** 09/07/23**Report Date:** 10/02/23

Radiochemistry

Analysis Method: EPA 901.1M**ABatch Sample ID:** ARS1-B23-01775-05

Analysis Description	Analysis Results	CSU +/- 2 s	MDA	DLC	CRDL	Qual	Analysis Units	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Cs-137	0.013	0.032	0.045	0.023	0.07	U	pCi/g	09/29/23 9:25	SDW	N/A
Ra-226	0.336	0.083	0.083	0.041	0.1		pCi/g	09/29/23 9:25	SDW	N/A



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ARS Sample Delivery Group: ARS1-23-01973**Client Sample ID:** HPPC-ESU-315A-033**Sample Collection Date:** 09/06/23 10:30**Sample Matrix:** Soil/Solid/Sludge**Percent Solids:** 89.9%**Request or PO Number:** J310000600**ARS Sample ID:** ARS1-23-01973-003**Date Received:** 09/07/23**Report Date:** 10/02/23

Radiochemistry

Analysis Method: EPA 901.1M**ABatch Sample ID:** ARS1-B23-01775-06

Analysis Description	Analysis Results	CSU +/- 2 s	MDA	DLC	CRDL	Qual	Analysis Units	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Cs-137	0.009	0.034	0.046	0.023	0.07	U	pCi/g	09/29/23 10:28	SDW	N/A
Ra-226	0.301	0.075	0.076	0.038	0.1		pCi/g	09/29/23 10:28	SDW	N/A

Analysis Method: Eichrom SRW01**ABatch Sample ID:** ARS1-B23-01624-04

Analysis Description	Analysis Results	CSU +/- 2 s	MDA	DLC	CRDL	Qual	Analysis Units	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
SR-90	-0.004	0.077	0.140	0.065	0.15	U	pCi/g	09/13/23 11:09	DWILLIAMS	92.2%



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ARS Sample Delivery Group: ARS1-23-01973**Client Sample ID:** HPPC-ESU-315A-033-FD**Sample Collection Date:** 09/06/23 10:30**Sample Matrix:** Soil/Solid/Sludge**Percent Solids:** 89.2%**Request or PO Number:** J310000600**ARS Sample ID:** ARS1-23-01973-004**Date Received:** 09/07/23**Report Date:** 10/02/23

Radiochemistry

Analysis Method: EPA 901.1M**ABatch Sample ID:** ARS1-B23-01775-07

Analysis Description	Analysis Results	CSU +/- 2 s	MDA	DLC	CRDL	Qual	Analysis Units	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Cs-137	0.003	0.034	0.050	0.025	0.07	U	pCi/g	09/29/23 10:29	SDW	N/A
Ra-226	0.354	0.087	0.089	0.045	0.1		pCi/g	09/29/23 10:29	SDW	N/A

Analysis Method: Eichrom SRW01**ABatch Sample ID:** ARS1-B23-01624-06

Analysis Description	Analysis Results	CSU +/- 2 s	MDA	DLC	CRDL	Qual	Analysis Units	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
SR-90	0.130	0.087	0.132	0.061	0.15	U	pCi/g	09/13/23 11:09	DWILLIAMS	92.2%



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ARS Sample Delivery Group: ARS1-23-01973**Client Sample ID:** HPPC-ESU-315A-034**Sample Collection Date:** 09/06/23 10:35**Sample Matrix:** Soil/Solid/Sludge**Percent Solids:** %**Request or PO Number:** J310000600**ARS Sample ID:** ARS1-23-01973-005**Date Received:** 09/07/23**Report Date:** 10/02/23

Radiochemistry

Analysis Method: EPA 901.1M**ABatch Sample ID:** ARS1-B23-01775-08

Analysis Description	Analysis Results	CSU +/- 2 s	MDA	DLC	CRDL	Qual	Analysis Units	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Cs-137	-0.005	0.032	0.044	0.022	0.07	U	pCi/g	09/29/23 11:33	SDW	N/A
Ra-226	0.365	0.081	0.073	0.037	0.1		pCi/g	09/29/23 11:33	SDW	N/A



ARS Aleut Analytical, LLC Analytical Reports

for

GES-AIS, LLC

Batch QC



QC Results per Analytical Batch

Analytical Batch	ARS1-B23-01624
SDG	ARS1-23-01973
Analysis	Strontium-90 in (Soil, Sludge, Biota, Sediment [SO, BI, VG])
Method	Eichrom SRW01
Analysis Code	GPC-SR90-SO
Report Units	pCi/g

Acceptable QC Performance Ranges

QC Sample Type	Performance Items and Ranges		
Laboratory Control Sample	Recovery (%):	> 75	< 125
Matrix Spike	Recovery (%):	> 60	< 140
Duplicate	Duplicate Error Ratio (DER):		< 3
	Relative Percent Difference (RPD %):		≤ 25

Laboratory Control Sample

			Analysis Date	09/13/23 11:08	Analysis Technician	DWILLIAMS	
Analysis Batch Sample ID	QC Type	Analyte	Results	CSU (2s)	Expected Value	LCS Rec (%)	MDA
ARS1-B23-01624-01	LCS	SR-90	22.039	3.370	20.053	109.9	0.388

Duplicate RER/DER/RPD

Duplicate RER/DER/RPD		Analysis Date	09/13/23 11:08	Analysis Technician	DWILLIAMS	
Analyte	Results LCS	CSU LCS (2s)	Results LCSD	CSU LCSD (2s)	DER	RPD
SR-90	22.039	3.370	20.044	3.071	0.857	9.5

Duplicate RER/DER/RPD (Dup Sample)

			Analysis Date	09/13/23 11:09	Analysis Technician	DWILLIAMS	
Analysis Batch Sample ID	Analyte	Results DO	CSU DO (2s)	Results DUP	CSU DUP (2s)	DER	RPD
ARS1-B23-01624-05	SR-90	-0.004	0.077	0.063	0.081	1.169	NC

Method Blank

Method Blank		Analysis Date	09/13/23 11:09	Analysis Technician	DWILLIAMS	
Analysis Batch Sample ID	QC Type	Analyte	Results	CSU (2s)	MDA	Qual
ARS1-B23-01624-03	MBL	SR-90	0.166	0.110	0.170	U



QC Results per Analytical Batch

Analytical Batch	ARS1-B23-01775
SDG	ARS1-23-01973
Analysis	Gamma Spec - 21 Day Ingrowth in (Soil, Sludge, Waste, Sediment, Biota [SO, BI, VG])
Method	EPA 901.1M
Analysis Code	GAM-IG21-SO
Report Units	pCi/g

Acceptable QC Performance Ranges

QC Sample Type	Performance Items and Ranges		
Laboratory Control Sample	Recovery (%):	> 75	< 125
Matrix Spike	Recovery (%):	> 60	< 140
Duplicate	Duplicate Error Ratio (DER):		< 3
	Relative Percent Difference (RPD %):		≤ 40

Laboratory Control Sample			Analysis Date	09/29/23 08:55	Analysis Technician	SDW	
Analysis Batch Sample ID	QC Type	Analyte	Results	CSU (2s)	Expected Value	LCS Rec (%)	MDA
ARS1-B23-01775-01	LCS	AM-241	2.131E+4	1.843E+3	2.275E+4	93.7	575.800
ARS1-B23-01775-01	LCS	CO-60	4.316E+4	2.028E+3	4.279E+4	100.9	776.400
ARS1-B23-01775-01	LCS	CS-137	3.690E+4	1.667E+3	3.545E+4	104.1	264.400

Duplicate RER/DER/RPD		Analysis Date	09/29/23 09:08	Analysis Technician	SDW	
Analyte	Results LCS	CSU LCS (2s)	Results LCSD	CSU LCSD (2s)	DER	RPD
AM-241	2.131E+4	1.843E+3	2.320E+4	1.962E+3	1.375	8.5
CO-60	4.316E+4	2.028E+3	4.049E+4	2.307E+3	1.707	6.4
CS-137	3.690E+4	1.667E+3	3.637E+4	1.642E+3	0.445	1.4

Duplicate RER/DER/RPD (Dup Sample)			Analysis Date	09/29/23 12:43	Analysis Technician	SDW	
Analysis Batch Sample ID	Analyte	Results DO	CSU DO (2s)	Results DUP	CSU DUP (2s)	DER	RPD
ARS1-B23-01775-09	CS-137	-0.005	0.032	-0.017	0.036	0.493	NC
ARS1-B23-01775-09	RA-226	0.365	0.081	0.405	0.103	0.596	10.4

Method Blank		Analysis Date	09/29/23 11:34	Analysis Technician	SDW	
Analysis Batch Sample ID	QC Type	Analyte	Results	CSU (2s)	MDA	Qual
ARS1-B23-01775-03	MBL	CS-137	0.012	0.028	0.041	U
ARS1-B23-01775-03	MBL	RA-226	-0.009	0.033	0.105	U



ARS Aleut Analytical, LLC Analytical Reports

for

GES-AIS, LLC

QC Summary



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QC Sample Results

Analytical Batch: ARS1-B23-01624**Lab Sample ID:** ARS1-B23-01624-01**Method:** Eichrom SRW01**Sample Type:** LCS**Matrix:** Soil/Solid/Sludge**Analysis Date:** 09/13/23 11:08

Analyte	Spike Added	Analysis Result	Qual	Analysis Units	% Rec	% Rec Limits
SR-90	20.053	22.039		pCi/g	109.9	75 - 125



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QC Sample Results

Analytical Batch: ARS1-B23-01624**Lab Sample ID:** ARS1-B23-01624-02**Method:** Eichrom SRW01**Sample Type:** LCSD**Matrix:** Soil/Solid/Sludge**Analysis Date:** 09/13/23 11:08

Analyte	Spike Added	Analysis Result	Qual	Analysis Units	% Rec	% Rec Limits	RPD	RPD Limit	DER	DER Limit
SR-90	19.935	20.044		pCi/g	100.5	75 - 125	9.5	25	0.857	3



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QC Sample Results

Analytical Batch: ARS1-B23-01624**Lab Sample ID:** ARS1-B23-01624-03**Method:** Eichrom SRW01**Sample Type:** MBL**Matrix:** Soil/Solid/Sludge**Analysis Date:** 09/13/23 11:09

Analyte	Analysis Result	CSU +/- 2 s	MDA	DLC	Qual	Analysis Units
SR-90	0.166	0.110	0.170	0.079	U	pCi/g



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QC Sample Results

Analytical Batch: ARS1-B23-01624**Lab Sample ID:** ARS1-B23-01624-05**Method:** Eichrom SRW01**Sample Type:** DUP**Matrix:** Soil/Solid/Sludge**Analysis Date:** 09/13/23 11:09

Analyte	DO Result	DO Qual	DUP Result	DUP Qual	Analysis Units	RPD	RPD Limit	DER	DER Limit
SR-90	-0.004	U	0.063	U	pCi/g	NC	25	1.169	3



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QC Association Summary

ARS Sample Delivery Group: ARS1-23-01973

Analytical Batch: ARS1-B23-01624

Analysis: Strontium-90 in (Soil, Sludge, Biota, Sediment [SO, BI, VG])

Batch Sample ID	Lab Sample ID	Client Sample ID	Matrix	Method	Prep Method
ARS1-B23-01624-01		Lab Control Sample	Soil/Solid/Sludge	Eichrom SRW01	N/A
ARS1-B23-01624-02		Lab Control Sample Duplicate	Soil/Solid/Sludge	Eichrom SRW01	N/A
ARS1-B23-01624-03		Method Blank	Soil/Solid/Sludge	Eichrom SRW01	N/A
ARS1-B23-01624-04	ARS1-23-01973-003	HPPC-ESU-315A-033	Soil/Solid/Sludge	Eichrom SRW01	N/A
ARS1-B23-01624-05		Sample Duplicate (HPPC-ESU-315A-033)	Soil/Solid/Sludge	Eichrom SRW01	N/A
ARS1-B23-01624-06	ARS1-23-01973-004	HPPC-ESU-315A-033-FD	Soil/Solid/Sludge	Eichrom SRW01	N/A



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QC Sample Results

Analytical Batch: ARS1-B23-01775**Lab Sample ID:** ARS1-B23-01775-01**Method:** EPA 901.1M**Sample Type:** LCS**Matrix:** Soil/Solid/Sludge**Analysis Date:** 09/29/23 8:55

Analyte	Spike Added	Analysis Result	Qual	Analysis Units	% Rec	% Rec Limits
Am-241	2.275E+4	2.131E+4		pCi/g	93.7	75 - 125
Co-60	4.279E+4	4.316E+4		pCi/g	100.9	75 - 125
Cs-137	3.545E+4	3.690E+4		pCi/g	104.1	75 - 125



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QC Sample Results

Analytical Batch: ARS1-B23-01775**Lab Sample ID:** ARS1-B23-01775-02**Method:** EPA 901.1M**Sample Type:** LCSD**Matrix:** Soil/Solid/Sludge**Analysis Date:** 09/29/23 9:08

Analyte	Spike Added	Analysis Result	Qual	Analysis Units	% Rec	% Rec Limits	RPD	RPD Limit	DER	DER Limit
Am-241	2.275E+4	2.320E+4		pCi/g	102.0	75 - 125	8.5	40	1.375	3
Co-60	4.279E+4	4.049E+4		pCi/g	94.6	75 - 125	6.4	40	1.707	3
Cs-137	3.545E+4	3.637E+4		pCi/g	102.6	75 - 125	1.4	40	0.445	3



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QC Sample Results

Analytical Batch: ARS1-B23-01775**Lab Sample ID:** ARS1-B23-01775-03**Method:** EPA 901.1M**Sample Type:** MBL**Matrix:** Soil/Solid/Sludge**Analysis Date:** 09/29/23 11:34

Analyte	Analysis Result	CSU +/- 2 s	MDA	DLC	Qual	Analysis Units
Cs-137	0.012	0.028	0.041	0.020	U	pCi/g
Ra-226	-0.009	0.033	0.105	0.053	U	pCi/g



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QC Sample Results

Analytical Batch: ARS1-B23-01775**Lab Sample ID:** ARS1-B23-01775-09**Method:** EPA 901.1M**Sample Type:** DUP**Matrix:** Soil/Solid/Sludge**Analysis Date:** 09/29/23 12:43

Analyte	DO Result	DO Qual	DUP Result	DUP Qual	Analysis Units	RPD	RPD Limit	DER	DER Limit
Cs-137	-0.005	U	-0.017	U	pCi/g	NC	40	0.493	3
Ra-226	0.365		0.405		pCi/g	10.4	40	0.596	3



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QC Association Summary

ARS Sample Delivery Group: ARS1-23-01973

Analytical Batch: ARS1-B23-01775

Analysis: Gamma Spec - 21 Day Ingrowth in (Soil, Sludge, Waste, Sediment, Biota [SO, BI, VG])

Batch Sample ID	Lab Sample ID	Client Sample ID	Matrix	Method	Prep Method
ARS1-B23-01775-01		Lab Control Sample	Soil/Solid/Sludge	EPA 901.1M	N/A
ARS1-B23-01775-02		Lab Control Sample Duplicate	Soil/Solid/Sludge	EPA 901.1M	N/A
ARS1-B23-01775-03		Method Blank	Soil/Solid/Sludge	EPA 901.1M	N/A
ARS1-B23-01775-04	ARS1-23-01973-001	HPPC-ESU-315A-031	Soil/Solid/Sludge	EPA 901.1M	N/A
ARS1-B23-01775-05	ARS1-23-01973-002	HPPC-ESU-315A-032	Soil/Solid/Sludge	EPA 901.1M	N/A
ARS1-B23-01775-06	ARS1-23-01973-003	HPPC-ESU-315A-033	Soil/Solid/Sludge	EPA 901.1M	N/A
ARS1-B23-01775-07	ARS1-23-01973-004	HPPC-ESU-315A-033-FD	Soil/Solid/Sludge	EPA 901.1M	N/A
ARS1-B23-01775-08	ARS1-23-01973-005	HPPC-ESU-315A-034	Soil/Solid/Sludge	EPA 901.1M	N/A
ARS1-B23-01775-09		Sample Duplicate (HPPC-ESU-315A-034)	Soil/Solid/Sludge	EPA 901.1M	N/A



Z Values per Analytical Batch

Analytical Batch	ARS1-B23-01624
SDG	ARS1-23-01973
Analysis	Strontium-90 in (Soil, Sludge, Biota,
Analysis Test Method	PALA-RAD-032/Eichrom SRW01,EPA
Analysis Code	GPC-SR90-SO
Report Units	pCi/g

Acceptable QC Performance Ranges

QC Sample Type	Performance Items and Ranges
Laboratory Control Sample	ZLCS <= 3
Matrix Spike	ZMS <= 3
Method Blank	ZBLANK <= 3
Duplicate	ZDUP <= 3

Laboratory Control Sample	Analysis Date	09/13/23 11:08	Analysis Technician	DWILLIAMS		
QC Type	Analyte	Results	CSU (1s)	Expected Value	CSU (1s)	Z
LCS	SR-90	22.039	1.719	20.053	0.334	1.134
LCSD	SR-90	20.044	1.567	19.935	0.334	0.068

Method Blank	Analysis Date	09/13/23 11:09	Analysis Technician	DWILLIAMS		
QC Type	Analyte	Results	CSU (1s)	Z		
MBL	SR-90	0.166	0.056	2.973		

Duplicate Sample	Analysis Date	09/13/23 11:09	Analysis Technician	DWILLIAMS		
QC Type	Analyte	Results Dup	CSU (1s)	Results DO	CSU (1s)	Z
DUP	SR-90	0.063	0.042	-0.004	0.039	1.169
LCSD	SR-90	20.044	1.567	22.039	1.719	0.857



Z Values per Analytical Batch

Analytical Batch	ARS1-B23-01775
SDG	ARS1-23-01973
Analysis	Gamma Spec - 21 Day Ingrowth in (Soil,
Analysis Test Method	PALA-RAD-007/EPA 901.1M
Analysis Code	GAM-IG21-SO
Report Units	pCi/g

Acceptable QC Performance Ranges

QC Sample Type	Performance Items and Ranges
Laboratory Control Sample	ZLCS <= 3
Matrix Spike	ZMS <= 3
Method Blank	ZBLANK <= 3
Duplicate	ZDUP <= 3

Laboratory Control Sample	Analysis Date	09/29/23 08:55	Analysis Technician	SDW		
QC Type	Analyte	Results	CSU (1s)	Expected Value	CSU (1s)	Z
LCS	AM-241	2.131E+4	940.408	2.275E+4	682.432	1.241
LCSD	AM-241	2.320E+4	1.001E+3	2.275E+4	682.432	0.369
LCS	CO-60	4.316E+4	1.035E+3	4.279E+4	1.284E+3	0.225
LCSD	CO-60	4.049E+4	1.177E+3	4.279E+4	1.284E+3	1.323
LCS	CS-137	3.690E+4	850.612	3.545E+4	1.064E+3	1.064
LCSD	CS-137	3.637E+4	837.704	3.545E+4	1.064E+3	0.678

Method Blank	Analysis Date	09/29/23 11:34	Analysis Technician	SDW	
	QC Type	Analyte	Results	CSU (1s)	Z
	MBL	CS-137	0.012	0.014	0.832
	MBL	RA-226	-0.009	0.017	0.532

Duplicate Sample	Analysis Date	09/29/23 12:43	Analysis Technician	SDW		
QC Type	Analyte	Results Dup	CSU (1s)	Results DO	CSU (1s)	Z
DUP	RA-226	0.405	0.053	0.365	0.041	0.596
DUP	CS-137	-0.017	0.018	-0.005	0.016	0.493
LCSD	AM-241	2.320E+4	1.001E+3	2.131E+4	940.408	1.375
LCSD	CO-60	4.049E+4	1.177E+3	4.316E+4	1.035E+3	1.707
LCSD	CS-137	3.637E+4	837.704	3.690E+4	850.612	0.445



ARS Aleut Analytical, LLC Analytical Reports

for

GES-AIS, LLC

Sample Management Records

CHAIN-OF-CUSTODY
RECORD

Gilbane Federal
Brett Womack
1501 W Fountainhead Parkway, Suite 550, Tempe, Arizona 85282
bwomack@ges-ais.com

COC # 090623P13302



Project Name: Hunters Point Shipyard, Parcel C Removal Site Evaluation	Laboratory: ARS Aleut Analytical (AAA), Port Allen, LA	Event: Work Area 33 Phase 1
Project Number: J310000600	POC: Keith Greene Keith.Greene@aaa.aaleut.federal.com	
WBS Code: J310000600	Ship to: 2609 North River Road, Port Allen, LA 70767-3469	

Comments: Please place on 21-day ingrowth. High Priority 28 day TAT Do not dispose, return to GES after 90 days.	Analytical Test Method E901.1 - Gamma Spec Ra226 Cs137 SR02RC - Sr90	Code Matrix SO Soil	Code Container/Preservative 1 1x Gallon Ziploc Bag, None
Equipment:			

Event: Work Area 33 Phase 1														1	1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							</
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Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time	Shipping Date / Carrier / Airbill Number
	09/06/23	1600	Fed Ex	09/06/23	1600	Shipping Date: 11 09/04/2023 Fed Ex Master # 7733 2324 1396 2nd # 7733 2324 1683
				9-7-23	17:00	Received by Laboratory: (Signature, Date, Time) & condition

SDG Report - Samples and Containers

SDG Specific Data

SDG	ARS1-23-01973			TAT Days	28 Calendar Days	Project Type	Environmental
Sample Count	5	Rpt Level	4	Date Received	09/07/2023	COC Number	090623P13302
Client	GES-AIS, LLC			Discrepancy Resol	N/A	PO Number	
Client Code	1138			Client Deadline	10/05/2023	Job Number	J310000600
Profile Number	PN-01440					Job Location	Hunters Point Shipyard, Parcel C Removal Site Evaluation
Comment	Priority sample per email.						

Samples and Containers Checked In Thus Far

FR	Name	Matrix	Start Date	End Date	Disp	Hold	Arch	Storage	Comments
001	HPPC-ESU-315A-031	Soil/Sol id/Slud ge	09/06/2023 10:20	09/06/2023 10:20	H	30	10	PrePrep	
	IC_ID	Cnt	Container Type	Container Size	pH Orig	pH Final	Temp (C)		Comments
	447544	1	HDP Container	Plastic Zip Bag					
002	HPPC-ESU-315A-032	Soil/Sol id/Slud ge	09/06/2023 10:23	09/06/2023 10:23	H	30	10	PrePrep	
	IC_ID	Cnt	Container Type	Container Size	pH Orig	pH Final	Temp (C)		Comments
	447545	1	HDP Container	Plastic Zip Bag					
003	HPPC-ESU-315A-033	Soil/Sol id/Slud ge	09/06/2023 10:30	09/06/2023 10:30	H	30	10	PrePrep	
	IC_ID	Cnt	Container Type	Container Size	pH Orig	pH Final	Temp (C)		Comments
	447546	1	HDP Container	Plastic Zip Bag					
004	HPPC-ESU-315A-033-FD	Soil/Sol id/Slud ge	09/06/2023 10:30	09/06/2023 10:30	H	30	10	PrePrep	
	IC_ID	Cnt	Container Type	Container Size	pH Orig	pH Final	Temp (C)		Comments
	447547	1	HDP Container	Plastic Zip Bag					
005	HPPC-ESU-315A-034	Soil/Sol id/Slud ge	09/06/2023 10:35	09/06/2023 10:35	H	30	10	PrePrep	
	IC_ID	Cnt	Container Type	Container Size	pH Orig	pH Final	Temp (C)		Comments
	447548	1	HDP Container	Plastic Zip Bag					

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Port Allen Laboratory

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SDG Report - Analysis Assignments

SDG	ARS1-23-01973	Sample Count	5
Client	GES-AIS, LLC	Analysis Count	2-7

Sample Count Totals Per Analysis			
Analysis Code	Analysis Description	In/Out	Samples Count
GAM-IG21-SO	Gamma Spec - 21 Day Ingrowth in (Soil, Sludge, Waste, Sediment, Biota [SO, BI, VG])	I	5
GPC-SR90-SO	Strontium-90 in (Soil, Sludge, Biota, Sediment [SO, BI, VG])	I	2

Analyses Assigned Per Fraction		
Fraction	Analysis Code	X = Assigned
001	GAM-IG21-SO	X
002	GAM-IG21-SO	X
003	GAM-IG21-SO	X
003	GPC-SR90-SO	X
004	GAM-IG21-SO	X
004	GPC-SR90-SO	X
005	GAM-IG21-SO	X

ARS Aleut Analytical, LLC
Port Allen Laboratory

DQO Report for SDG

ARS1-23-01973

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Page 1 of 2

Client Name: GES-AIS, LLC

Profile Name: Parcel C Rad Sampling

Report Level: 4

Analysis Code	Prep Type	Units	Aliquot	Prep Code	Procedure	Count Time					
GAM-IG21-SO	DG21	pCi	g	N/A	PALA-RAD-007						
	Analyte			RDL	LCS LL/UL	MS LL/UL	RadY LL/UL	GravY LL/UL	RER	RPD	Surr LL/UL
	Cs-137 (10045-97-3)			0.07 pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Ra-226 (13982-63-3)			0.1 pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
GPC-SR90-SO	DRAD	pCi	g	N/A	PALA-RAD-032						
	Analyte			RDL	LCS LL/UL	MS LL/UL	RadY LL/UL	GravY LL/UL	RER	RPD	Surr LL/UL
	Sr-90 (10098-97-2)			0.15 pCi/g	75/125	60/140	30/110	30/110	1	25	N/A

DQO Report for SDG

ARS1-23-01973

Analysis Code	Fraction	Units	Aliquot	Conductivity	Analyte Count
GAM-IG21-SO	001	pCi	g	N/A	2
		Group		Analyte	
		Parcel C Work Area 34 Phase I		Cs-137	
		Parcel C Work Area 34 Phase I		Ra-226	
GAM-IG21-SO	002	pCi	g	N/A	2
		Group		Analyte	
		Parcel C Work Area 34 Phase I		Cs-137	
		Parcel C Work Area 34 Phase I		Ra-226	
GAM-IG21-SO	003	pCi	g	N/A	2
		Group		Analyte	
		Parcel C Work Area 34 Phase I		Cs-137	
		Parcel C Work Area 34 Phase I		Ra-226	
GAM-IG21-SO	004	pCi	g	N/A	2
		Group		Analyte	
		Parcel C Work Area 34 Phase I		Cs-137	
		Parcel C Work Area 34 Phase I		Ra-226	
GAM-IG21-SO	005	pCi	g	N/A	2
		Group		Analyte	
		Parcel C Work Area 34 Phase I		Cs-137	
		Parcel C Work Area 34 Phase I		Ra-226	
GPC-SR90-SO	003	pCi	g	N/A	1
		Group		Analyte	
		Parcel C Rad Sampling		Sr-90	
GPC-SR90-SO	004	pCi	g	N/A	1
		Group		Analyte	
		Parcel C Rad Sampling		Sr-90	

PALA Sample Receipt Inspection Form

Client Name: GESSDG: ARS1-23-01973Sample Custodian: Juan LopezSurvey Start Date: 9-7-23Survey Start Time: 14:15Thermometer ID: E1054012261Calibration Due Date: 1-12-24pH Paper Lot# NAExposure Rate Meter + Probe Unit ID: 273629Calibration Due Date: 9-13-23Background: 5 $\mu\text{R/hr}$ Count Rate Meter + Probe Unit ID: 268993Calibration Due Date: 9-19-23Background: 20 cpmDelivery Type (circle one): Direct Lock Box Commercial Carrier: Fed ExTotal # of ESCs: 1External Shipping
Container Tracking:Exposure Rate
($\mu\text{R/hr}$)
(limit <500 $\mu\text{R/hr}$)Max External Swipe
Counts (cpm)Max Internal Swipe
Counts (cpm)ESC True
Temps* ($^{\circ}\text{C}$)*True temperature is recorded which includes any applicable correction factors.
TRAX Matrix ID (circle all that apply):
(See Section 4.3 of SOP)A: 77332324139452020

AQ WD WG WO

B: _____

WS WW SI UR

C: _____

OL OL BI VG

D: _____

WP SM AF

E: _____

F: _____

Visual Inspection:

External Shipping Container

(Circle response)

Good Condition
with no Leaks or TearsYes No

Marked Radioactive

Yes No

UN2910

Yes No

Security Seals

Yes No

If yes, intact?

Yes No N/A

Internal Shipping Container

COC's Present

Yes NoWell packaged container with
no signs of leakageYes No

Comments:

COC/Sample Inspection

(Circle response)

Sample Containers in good condition

Yes No

No spills or leaks

Yes No

Marked Radioactive

Yes No

Durable labels w/indelible ink

Yes No

COC relinquished/received correctly

Yes No

Adequate volume/filled correctly

Yes No

Hold Time sufficient for analysis

Yes No

For VOC/Radon, Head space?

Yes No N/A

If yes, <6mm?

Yes No N/A

of containers received matches # on COC

Yes No

Samples received on ice?

Yes No

Type (circle one):

Bagged Ice

Loose Ice

Blue Ice

N/A

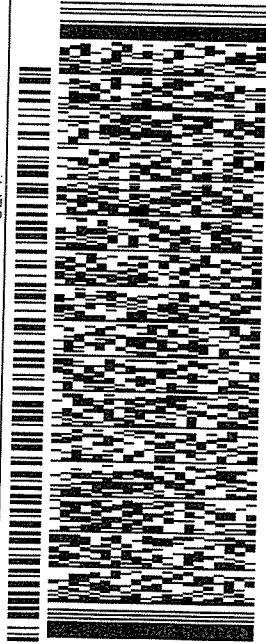
ORIGIN ID: JCCA (925) 586-5968
 ANDREW ALEXANDER
 GES-AIS
 200 FISHER STREET
 SAN FRANCISCO, CA 94124
 UNITED STATES US

SHIP DATE: 06SEP23
 ACTWGT: 50.00 LB
 CAD: 254128867/INET4640
 DIMS: 24x12x16 IN
 BILL SENDER

TO KEITH GREENE
 ARS ALEUT ANALYTICAL, LLC
 2609 NORTH RIVER ROAD

PORT ALLEN LA 70767

(225) 381-2991 REF: J310000400
 INV: PO: DEPT:

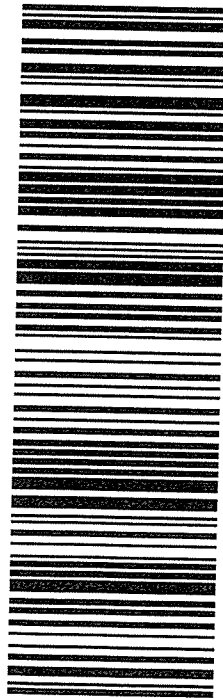


J2331230731014v

THU - 07 SEP 5:00P
 STANDARD OVERNIGHT

1 of 2
 TRK# 7733 2324 1396
 0201
 ## MASTER ##

AM OPLA
 70767
 LA-US MSY



After printing this label:

1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2. Fold the printed page along the horizontal line.
3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

Warning: Use only the printed original label for shipping. Using a photocopy of this label for shipping purposes is fraudulent and could result in additional billing charges, along with the cancellation of your FedEx account number.

Use of this system constitutes your agreement to the service conditions in the current FedEx Service Guide, available on fedex.com. FedEx will not be responsible for any claim in excess of \$100 per package, whether the result of loss, damage, delay, non-delivery, misdelivery, or misinformation, unless you declare a higher value, pay an additional charge, document your actual loss and file a timely claim. Limitations found in the current FedEx Service Guide apply. Your right to recover from FedEx for any loss, including incidental, consequential, or special is limited to the greater of \$100 or the attorney's fees, costs, and other forms of damage whether direct, incidental, consequential, or special is limited to the greater of \$1,000, e.g. jewelry, authorized declared value. Recovery cannot exceed actual documented loss. Maximum for items of extraordinary value is \$1,000, e.g. jewelry. FedEx Service Guide.




ARS Aleut Analytical, LLC Analytical Reports

for

GES-AIS, LLC

Gamma Spec - Raw Data


Analytical Batch Report

	Analysis Batch ID ARS1-B23-01775												
	Procedure		PALA-RAD-007		Analysis		GAM-IG21-SO			Prep	N/A		
	Description		Gamma Spec - 21 Day Ingrowth in (Soil, Sludge, Waste, Sediment,Biota [SO, BI, VG])										
ABatch Sample ID	Type	Blinds			SDG		FR	Run	Matrix	Holding Deadline	Client ID	Group Name	Lab Deadline
ARS1-B23-01775-01	LCS	1595-98-4			1595-98-4 - GAMMA GEOMETRY: 250 mL (8oz.) Tuna Can								
ARS1-B23-01775-02	LCSD	1595-98-4			1595-98-4 - GAMMA GEOMETRY: 250 mL (8oz.) Tuna Can								
ARS1-B23-01775-03	MBL												
ARS1-B23-01775-04	TRG				ARS1-23-01973	001	1	SO			HPPC-ESU-315A-031	Parcel C Work Area 34 Phase I	10/02/23
ARS1-B23-01775-05	TRG				ARS1-23-01973	002	1	SO			HPPC-ESU-315A-032	Parcel C Work Area 34 Phase I	10/02/23
ARS1-B23-01775-06	TRG				ARS1-23-01973	003	1	SO			HPPC-ESU-315A-033	Parcel C Work Area 34 Phase I	10/02/23
ARS1-B23-01775-07	TRG				ARS1-23-01973	004	1	SO			HPPC-ESU-315A-033-FD	Parcel C Work Area 34 Phase I	10/02/23
ARS1-B23-01775-08	TRG				ARS1-23-01973	005	1	SO			HPPC-ESU-315A-034	Parcel C Work Area 34 Phase I	10/02/23
ARS1-B23-01775-09	DUP				Parent: ARS1-23-01973-005								

ARS Aleut Analytical, LLC
Port Allen Laboratory**LCS Report**
Analytical Batch: ARS1-B23-01775Printed: 10/2/2023 11:12 AM
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ABatch Sample ID	Isotope	Source ID	Ref Date	Ref ACT dpm	Expected Value CT	Mid Point Count Date	User ID	Mod Date
ARS1-B23-01775-01	Am-241	1595-98-4	07/01/2012	50500	22747.74775	09/29/2023	SWALDROP	09/29/2023
ARS1-B23-01775-02	Am-241	1595-98-4	07/01/2012	50500	22747.74775	09/29/2023	SWALDROP	09/29/2023
ARS1-B23-01775-01	Co-60	1595-98-4	07/01/2012	95000	42792.79279	09/29/2023	SWALDROP	09/29/2023
ARS1-B23-01775-02	Co-60	1595-98-4	07/01/2012	95000	42792.79279	09/29/2023	SWALDROP	09/29/2023
ARS1-B23-01775-01	Cs-137	1595-98-4	07/01/2012	78700	35450.45045	09/29/2023	SWALDROP	09/29/2023
ARS1-B23-01775-02	Cs-137	1595-98-4	07/01/2012	78700	35450.45045	09/29/2023	SWALDROP	09/29/2023


ARS Aleut Analytical, LLC
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		Analytical Batch ID ARS1-B23-01775													
		Analysis Code GAM-IG21-SO													
		Procedure No PALA-RAD-007													
		Matrix Soil/Solid/Sludge													
ABatch Sample ID	Sample Type	SDG	Fracton	Client ID	Run	Isotope	ACT	CSU 1s	CSU 2s	MDA	DLC	CU 1s	CU 2s	MCL	Result Units
ARS1-B23-01775-01	LCS					Am-241	21306.00000	940.40816	1843.20000	575.80000	287.90000	339.64286	665.70000		pCi/g
ARS1-B23-01775-01	LCS					Co-60	43164.00000	1034.84694	2028.30000	776.40000	388.20000	645.05102	1264.30000		pCi/g
ARS1-B23-01775-01	LCS					Cs-137	36899.00000	850.61224	1667.20000	264.40000	132.20000	390.06633	764.53000		pCi/g
ARS1-B23-01775-02	LCSD					Am-241	23195.00000	1001.17347	1962.30000	390.30000	195.15000	301.43878	590.82000		pCi/g
ARS1-B23-01775-02	LCSD					Co-60	40489.00000	1177.09184	2307.10000	776.80000	388.40000	899.64286	1763.30000		pCi/g
ARS1-B23-01775-02	LCSD					Cs-137	36368.00000	837.70408	1641.90000	248.30000	124.15000	383.07143	750.82000		pCi/g
ARS1-B23-01775-03	MBL					Cs-137	0.01177	0.01414	0.02772	0.04050	0.02025	0.01414	0.02771		pCi/g
ARS1-B23-01775-03	MBL					Ra-226	-0.00895	0.01682	0.03296	0.10500	0.05250	0.01681	0.03296		pCi/g
ARS1-B23-01775-04	TRG	ARS1-23-01973	001	HPPC-ESU-315A-031	1	Cs-137	-0.02149	0.01994	0.03909	0.05150	0.02575	0.01994	0.03908		pCi/g
ARS1-B23-01775-04	TRG	ARS1-23-01973	001	HPPC-ESU-315A-031	1	Ra-226	0.39364	0.03917	0.07676	0.05820	0.02910	0.03731	0.07313		pCi/g
ARS1-B23-01775-05	TRG	ARS1-23-01973	002	HPPC-ESU-315A-032	1	Cs-137	0.01284	0.01609	0.03153	0.04540	0.02270	0.01608	0.03153		pCi/g
ARS1-B23-01775-05	TRG	ARS1-23-01973	002	HPPC-ESU-315A-032	1	Ra-226	0.33574	0.04244	0.08318	0.08250	0.04125	0.04118	0.08071		pCi/g
ARS1-B23-01775-06	TRG	ARS1-23-01973	003	HPPC-ESU-315A-033	1	Cs-137	0.00909	0.01722	0.03375	0.04560	0.02280	0.01722	0.03375		pCi/g
ARS1-B23-01775-06	TRG	ARS1-23-01973	003	HPPC-ESU-315A-033	1	Ra-226	0.30123	0.03847	0.07541	0.07550	0.03775	0.03738	0.07326		pCi/g
ARS1-B23-01775-07	TRG	ARS1-23-01973	004	HPPC-ESU-315A-033-FD	1	Cs-137	0.00305	0.01733	0.03398	0.05020	0.02510	0.01733	0.03398		pCi/g
ARS1-B23-01775-07	TRG	ARS1-23-01973	004	HPPC-ESU-315A-033-FD	1	Ra-226	0.35392	0.04462	0.08746	0.08910	0.04455	0.04329	0.08484		pCi/g
ARS1-B23-01775-08	TRG	ARS1-23-01973	005	HPPC-ESU-315A-034	1	Cs-137	-0.00499	0.01634	0.03202	0.04360	0.02180	0.01634	0.03202		pCi/g
ARS1-B23-01775-08	TRG	ARS1-23-01973	005	HPPC-ESU-315A-034	1	Ra-226	0.36471	0.04139	0.08112	0.07320	0.03660	0.03989	0.07818		pCi/g
ARS1-B23-01775-09	DUP					Cs-137	-0.01712	0.01841	0.03608	0.05130	0.02565	0.01840	0.03607		pCi/g
ARS1-B23-01775-09	DUP					Ra-226	0.40464	0.05275	0.10339	0.09630	0.04815	0.05128	0.10050		pCi/g

ARS Aleut Analytical, LLC
Port Allen Laboratory**Calculation Report**
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		Analytical Batch ID			ARS1-B23-01775							
		Analysis Code			GAM-IG21-SO							
		Procedure No			PALA-RAD-007							
		Matrix			Soil/Solid/Sludge							
ABatch Sample ID	Sample Type	SDG	Fracton	Detector ID	Library	Geometry	Nuclide Energy (keV)	Peak Energy (keV)	FWHM	ALIQ	Sample Coll Date	Mid Point Count Date
ARS1-B23-01775-01	LCS			ARS06 MCB	LCS Fission.Lib	2275-19-5 250mL tc poly					9/29/2023	9/29/2023
ARS1-B23-01775-01	LCS			ARS06 MCB	LCS Fission.Lib	2275-19-5 250mL tc poly					9/29/2023	9/29/2023
ARS1-B23-01775-01	LCS			ARS06 MCB	LCS Fission.Lib	2275-19-5 250mL tc poly					9/29/2023	9/29/2023
ARS1-B23-01775-02	LCSD			ARS06 MCB	LCS Fission.Lib	2275-19-5 250mL tc poly					9/29/2023	9/29/2023
ARS1-B23-01775-02	LCSD			ARS06 MCB	LCS Fission.Lib	2275-19-5 250mL tc poly					9/29/2023	9/29/2023
ARS1-B23-01775-02	LCSD			ARS06 MCB	LCS Fission.Lib	2275-19-5 250mL tc poly					9/29/2023	9/29/2023
ARS1-B23-01775-03	MBL			(ARS03) MC	ITSI COUNT.Lib	250mL tuna can poly 1948-64-2					9/29/2023	9/29/2023
ARS1-B23-01775-03	MBL			(ARS03) MC	ITSI COUNT.Lib	250mL tuna can poly 1948-64-2					9/29/2023	9/29/2023
ARS1-B23-01775-04	TRG	ARS1-23-01973	001	ARS06 MCB	ITSI COUNT.Lib	2275-19-5 250mL tc poly					9/6/2023	9/29/2023
ARS1-B23-01775-04	TRG	ARS1-23-01973	001	ARS06 MCB	ITSI COUNT.Lib	2275-19-5 250mL tc poly					9/6/2023	9/29/2023
ARS1-B23-01775-05	TRG	ARS1-23-01973	002	(ARS03) MC	ITSI COUNT.Lib	250mL tuna can poly 1948-64-2					9/6/2023	9/29/2023
ARS1-B23-01775-05	TRG	ARS1-23-01973	002	(ARS03) MC	ITSI COUNT.Lib	250mL tuna can poly 1948-64-2					9/6/2023	9/29/2023
ARS1-B23-01775-06	TRG	ARS1-23-01973	003	ARS06 MCB	ITSI COUNT.Lib	2275-19-5 250mL tc poly					9/6/2023	9/29/2023
ARS1-B23-01775-06	TRG	ARS1-23-01973	003	ARS06 MCB	ITSI COUNT.Lib	2275-19-5 250mL tc poly					9/6/2023	9/29/2023
ARS1-B23-01775-07	TRG	ARS1-23-01973	004	(ARS03) MC	ITSI COUNT.Lib	250mL tuna can poly 1948-64-2					9/6/2023	9/29/2023
ARS1-B23-01775-07	TRG	ARS1-23-01973	004	(ARS03) MC	ITSI COUNT.Lib	250mL tuna can poly 1948-64-2					9/6/2023	9/29/2023
ARS1-B23-01775-08	TRG	ARS1-23-01973	005	ARS06 MCB	ITSI COUNT.Lib	2275-19-5 250mL tc poly					9/6/2023	9/29/2023
ARS1-B23-01775-08	TRG	ARS1-23-01973	005	ARS06 MCB	ITSI COUNT.Lib	2275-19-5 250mL tc poly					9/6/2023	9/29/2023
ARS1-B23-01775-09	DUP			(ARS03) MC	ITSI COUNT.Lib	250mL tuna can poly 1948-64-2					9/29/2023	9/29/2023
ARS1-B23-01775-09	DUP			(ARS03) MC	ITSI COUNT.Lib	250mL tuna can poly 1948-64-2					9/29/2023	9/29/2023

ARS Aleut Analytical, LLC
Port Allen Laboratory**Calculation Report**
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		Analytical Batch ID		ARS1-B23-01775					
		Analysis Code		GAM-IG21-SO					
		Procedure No		PALA-RAD-007					
		Matrix		Soil/Solid/Sludge					
ABatch Sample ID	Sample Type	SDG	Fracton	Qualifier	Expected Result	Percent Recovery	RPD	RER	DER
ARS1-B23-01775-01	LCS				22747.74775	93.7%			
ARS1-B23-01775-01	LCS				42792.79279	100.9%			
ARS1-B23-01775-01	LCS				35450.45045	104.1%			
ARS1-B23-01775-02	LCSD				22747.74775	102.0%	8.5%	0.97292	1.37524
ARS1-B23-01775-02	LCSD				42792.79279	94.6%	6.4%	1.20935	1.70675
ARS1-B23-01775-02	LCSD				35450.45045	102.6%	1.4%	0.31451	0.44478
ARS1-B23-01775-03	MBL			U					
ARS1-B23-01775-03	MBL			U					
ARS1-B23-01775-04	TRG	ARS1-23-01973	001	U					
ARS1-B23-01775-04	TRG	ARS1-23-01973	001						
ARS1-B23-01775-05	TRG	ARS1-23-01973	002	U					
ARS1-B23-01775-05	TRG	ARS1-23-01973	002						
ARS1-B23-01775-06	TRG	ARS1-23-01973	003	U					
ARS1-B23-01775-06	TRG	ARS1-23-01973	003						
ARS1-B23-01775-07	TRG	ARS1-23-01973	004	U					
ARS1-B23-01775-07	TRG	ARS1-23-01973	004						
ARS1-B23-01775-08	TRG	ARS1-23-01973	005	U					
ARS1-B23-01775-08	TRG	ARS1-23-01973	005						
ARS1-B23-01775-09	DUP			U				0.34894	0.49261
ARS1-B23-01775-09	DUP						10.4%	0.42417	0.59554

 Ortec Gamma		Batch Sample ID	ARS1-B23-01775-01		
		Analytical Batch	ARS1-B23-01775	Analysis Date	9/29/2023 08:54
		Analysis Code	GAM-IG21-SO	SDG	
		Detector	ARS06 MCB 133	Fraction	
		Count Time (sec)	600	Run	
		Library	LCS Fission.Lib		
		Geometry	2275-19-5 250mL tc poly		
Isotope	Activity	Units	CSU	MDA	DL
Am-241	2.1306E+004	pCi/g	1.8432E+003	5.7580E+002	2.8790E+002
Co-60	4.3164E+004	pCi/g	2.0283E+003	7.7640E+002	3.8820E+002
Cs-137	3.6899E+004	pCi/g	1.6672E+003	2.6440E+002	1.3220E+002

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 9:04:51 AM
 AAA Spectrum name: ARS06049.An1

Sample description

Batch ID: 23-01775-01
 SDG ID: 1595-98-4 Tech: SDW

Spectrum Filename: C:\User\ARS06049.An1

Acquisition information

Start time: 9/29/2023 8:54:40 AM
 Live time: 600
 Real time: 605
 Dead time: 0.76 %
 Detector ID: 21

Detector system

ARS06 MCB 133

Calibration

Filename: 2275-19-5 250mL tc poly cal 12-8-21.Clb
 2275-19-5 250mL tc poly
 12-8-21 EEC

Energy Calibration

Created: 12/8/2021 10:48:48 AM
 Zero offset: 0.100 keV
 Gain: 0.250 keV/channel
 Quadratic: -3.095E-08 keV/channel^2

Efficiency Calibration

Created: 12/8/2021 11:58:07 AM
 Type: Polynomial
 Uncertainty: 1.254 %
 Coefficients: -0.502841 -4.041766 0.314910
 -0.026798 0.000803 -0.000009

Library Files

Main analysis library: LCS Fission.Lib
 Library Match Width: 0.500
 Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G800W064
 Start channel: 10 (2.60keV)
 Stop channel: 8000 (1998.39keV)
 Peak rejection level: 40.000%
 Peak search sensitivity: 1
 Sample Size: 1.0000E+00 +/- 0.000E+00%
 Activity scaling factor: 1.0000E+06/(1.0000E+00* 1.0000E+00) =
 1.0000E+06
 Detection limit method: Reg. Guide 4.16 Method
 Random error: 1.0000000E+00
 Systematic error: 1.0000000E+00
 Fraction Limit: 0.000%
 Background width: best method (based on spectrum).
 Half lives decay limit: 12.000

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 9:04:51 AM
 AAA Spectrum name: ARS06049.An1

Activity range factor: 2.000
 Min. step backg. energy 0.000
 Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	7/1/2012 2:00:00 PM
Decay during acquisition:	NO	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	LCS.LCSD.Pbc 9/21/2023 8:04:19 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 0 cutoff: 0.00E+00 %
 Energy Calibration
 Normalized diff: 0.0917

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
32.38	196.	16.26	0.97	1.748E-02				
36.73	170.	21.26	0.98	2.095E-02				
46.58	4357.	2.26	0.87	2.877E-02				
59.58	6692.	1.56	0.91	3.972E-02	59.54	36.300	2.131E+04	AM241
573.53	63.	32.63	0.50	2.110E-02				
661.78	10308.	1.04	1.66	1.912E-02	661.66	85.210	3.690E+04	CS137
1173.48	2732.	2.09	1.97	1.249E-02	1173.24	99.900	4.324E+04	CO60
1332.79	2445.	2.05	2.08	1.122E-02	1332.50	99.982	4.308E+04	CO60

***** U N I D E N T I F I E D P E A K S U M M A R Y *****

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma %	FWHM keV	Suspected Nuclide
129.11	32.29	411.	196.	1.122E+04	32.52	0.971	- D
146.52	36.64	568.	170.	8.110E+03	42.52	0.976	- sD
185.89	46.59	1913.	4357.	1.515E+05	4.52	0.870	-
2294.08	573.43	118.	63.	3.004E+03	65.26	0.502	- s

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 L - Peak written from unknown list.
 C - Area < Critical level.

 This section based on library: LCS Fission.Lib

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 9:04:51 AM
 AAA Spectrum name: ARS06049.An1

***** I D E N T I F I E D P E A K S U M M A R Y *****

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma	FWHM % keV
AM-241	237.90	59.58	1461.	6692.	11.153	3.12	0.905
CS-137	2647.24	661.78	233.	10308.	17.180	2.07	1.662
CO-60	4695.63	1173.48	99.	2732.	4.554	4.18	1.973
CO-60	5333.57	1332.79	16.	2445.	4.076	4.11	2.081

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

Name	Code	Average Activity pCi/g	Energy keV	Activity pCi/g	Code	MDA Value pCi/g	COMMENTS
AM-241		2.1306E+04					1.58E+05
			59.54	2.131E+04	(	5.758E+02	1.56E+00 3.63E+01 G
CS-137		3.6899E+04					1.10E+04
			661.66	3.690E+04	(	2.644E+02	1.04E+00 8.52E+01 G
CO-60		4.3164E+04					1.93E+03
			1173.24	4.324E+04	(	7.764E+02	2.09E+00 9.99E+01 G
			1332.50	4.308E+04	(	3.720E+02	2.05E+00 1.00E+02 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
 ! - Peak is part of a multiplet and this area went negative during deconvolution.
 ? - Peak is too narrow.
 @ - Peak is too wide at FW25M, but ok at FWHM.
 % - Peak fails sensitivity test.
 \$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
 + - Peak activity higher than counting uncertainty range.
 - - Peak activity lower than counting uncertainty range.
 = - Peak outside analysis energy range.
 & - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
 P - Peakbackground subtraction
 } - Peak is too close to another for the activity to be found directly.

Nuclide Codes:

T - Thermal Neutron Activation

Peak Codes:

G - Gamma Ray

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 9:04:51 AM
 AAA Spectrum name: ARS06049.An1

F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

***** D I S C A R D E D I S O T O P E P E A K S *****
 Nuclide Centroid Background Net Area Intensity Uncert Activity
 Energy Counts Counts Cts/Sec 2 Sigma %

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****					
Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
AM-241	2.0925E+04	2.1306E+04	6.6570E+02	1.8432E+03	5.758E+02
CS-137	2.8500E+04	3.6899E+04	7.6453E+02	1.6672E+03	2.644E+02
CO-60	9.8394E+03	4.3164E+04	1.2643E+03	2.0283E+03	7.764E+02


< - MDA value printed.
 A - Activity printed, but activity < MDA.
 B - Activity < MDA and failed test.
 C - Area < Critical level.
 F - Failed fraction or key line test.
 H - Halflife limit exceeded

----- S U M M A R Y -----
 Total Activity (2.6 to 1998.4 keV) 5.926E+04 pCi/g
 Total Decayed Activity (2.6 to 1998.4 keV) 1.0136937E+05 pCi/g

Analyzed by: _____
 Countroom

Reviewed by: _____
 Supervisor

Laboratory: AAA

 Ortec Gamma		Batch Sample ID	ARS1-B23-01775-02		
		Analytical Batch	ARS1-B23-01775	Analysis Date	9/29/2023 09:07
		Analysis Code	GAM-IG21-SO	SDG	
		Detector	ARS06 MCB 133	Fraction	
		Count Time (sec)	600	Run	
		Library	LCS Fission.Lib		
		Geometry	2275-19-5 250mL tc poly		
Isotope	Activity	Units	CSU	MDA	DL
Am-241	2.3195E+004	pCi/g	1.9623E+003	3.9030E+002	1.9515E+002
Co-60	4.0489E+004	pCi/g	2.3071E+003	7.7680E+002	3.8840E+002
Cs-137	3.6368E+004	pCi/g	1.6419E+003	2.4830E+002	1.2415E+002

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 9:17:53 AM
 AAA Spectrum name: ARS06050.An1

Sample description

Batch ID: 23-01775-02
 SDG ID: 1595-98-4 Tech: SDW

Spectrum Filename: C:\User\ARS06050.An1

Acquisition information

Start time: 9/29/2023 9:07:41 AM
 Live time: 600
 Real time: 605
 Dead time: 0.75 %
 Detector ID: 21

Detector system

ARS06 MCB 133

Calibration

Filename: 2275-19-5 250mL tc poly cal 12-8-21.Clb
 2275-19-5 250mL tc poly
 12-8-21 EEC

Energy Calibration

Created: 12/8/2021 10:48:48 AM
 Zero offset: 0.100 keV
 Gain: 0.250 keV/channel
 Quadratic: -3.095E-08 keV/channel^2

Efficiency Calibration

Created: 12/8/2021 11:58:07 AM
 Type: Polynomial
 Uncertainty: 1.254 %
 Coefficients: -0.502841 -4.041766 0.314910
 -0.026798 0.000803 -0.000009

Library Files

Main analysis library: LCS Fission.Lib
 Library Match Width: 0.500
 Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G800W064
 Start channel: 10 (2.60keV)
 Stop channel: 8000 (1998.39keV)
 Peak rejection level: 40.000%
 Peak search sensitivity: 1
 Sample Size: 1.0000E+00 +/- 0.000E+00%
 Activity scaling factor: 1.0000E+06/(1.0000E+00* 1.0000E+00) =
 1.0000E+06
 Detection limit method: Reg. Guide 4.16 Method
 Random error: 1.0000000E+00
 Systematic error: 1.0000000E+00
 Fraction Limit: 0.000%
 Background width: best method (based on spectrum).
 Half lives decay limit: 12.000

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 9:17:53 AM
 AAA Spectrum name: ARS06050.An1

Activity range factor: 2.000
 Min. step backg. energy 0.000
 Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	7/1/2012 2:00:00 PM
Decay during acquisition:	NO	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	LCS.LCSD.Pbc 9/21/2023 8:04:19 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 0 cutoff: 0.00E+00 %
 Energy Calibration
 Normalized diff: 0.0767

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
12.30	137.	13.26	0.95	1.599E-03				
16.53	84.	24.16	0.95	4.975E-03				
19.40	54.	36.13	0.96	7.261E-03				
32.14	244.	14.83	1.05	1.737E-02				
36.84	124.	33.30	0.96	2.113E-02				
46.56	4267.	2.30	0.92	2.874E-02				
56.10	224.	23.23	1.00	3.693E-02				
59.60	7285.	1.27	1.00	3.970E-02	59.54	36.300	2.320E+04	AM241
572.82	61.	36.49	1.89	2.112E-02				
661.78	10159.	1.03	1.54	1.912E-02	661.66	85.210	3.637E+04	CS137
1173.45	2558.	2.18	2.11	1.249E-02	1173.24	99.900	4.049E+04	CO60
1332.77	2477.	2.09	2.05	1.122E-02	1332.50	99.982	4.365E+04	CO60
1617.66	9.	33.33	1.12	9.367E-03				

***** U N I D E N T I F I E D P E A K S U M M A R Y *****

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma	FWHM %	Suspected Nuclide
48.79	12.37	96.	137.	8.556E+04	26.52	0.947	- sD
65.72	16.60	164.	84.	1.688E+04	48.33	0.952	- sD
77.19	19.47	163.	54.	7.430E+03	72.26	0.956	- sD
128.13	32.15	442.	244.	1.402E+04	29.66	1.054	-
146.93	36.85	661.	124.	5.879E+03	66.59	0.959	- s
185.82	46.55	1915.	4267.	1.485E+05	4.60	0.915	-
224.04	56.06	1263.	225.	6.099E+03	46.57	0.999	- sD

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 9:17:53 AM
 AAA Spectrum name: ARS06050.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected
2291.20	572.78	130.	61.	2.907E+03	72.98	1.886	- s
6474.56	1617.66	0.	9.	9.608E+02	66.67	1.123	- s

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 L - Peak written from unknown list.
 C - Area < Critical level.

 This section based on library: LCS Fission.Lib

***** I D E N T I F I E D P E A K S U M M A R Y *****

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma	FWHM % keV
AM-241	237.73	59.54	662.	7285.	12.142	2.55	1.003D
CS-137	2647.21	661.78	205.	10159.	16.932	2.06	1.537
CO-60	4695.50	1173.45	99.	2558.	4.263	4.35	2.106
CO-60	5333.49	1332.77	40.	2477.	4.129	4.19	2.053

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide Name	- Average Code	- Activity pCi/g	- Energy keV	- Peak Activity pCi/g	- Code MDA Value pCi/g	- COMMENTS
AM-241		2.3195E+04	59.54	2.320E+04	(3.903E+02 1.27E+00 3.63E+01 G	1.58E+05
CS-137		3.6368E+04	661.66	3.637E+04	(2.483E+02 1.03E+00 8.52E+01 G	1.10E+04
CO-60		4.0489E+04	1173.24	4.049E+04	(7.768E+02 2.18E+00 9.99E+01 G	1.93E+03
			1332.50	4.365E+04	+ 5.644E+02 2.09E+00 1.00E+02 G	
(- This peak used in the nuclide activity average.						

* - Peak is too wide, but only one peak in library.
 ! - Peak is part of a multiplet and this area went negative during deconvolution.
 ? - Peak is too narrow.
 @ - Peak is too wide at FW25M, but ok at FWHM.
 % - Peak fails sensitivity test.
 \$ - Peak identified, but first peak of this nuclide

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 9:17:53 AM
 AAA Spectrum name: ARS06050.An1

failed one or more qualification tests.
 + - Peak activity higher than counting uncertainty range.
 - - Peak activity lower than counting uncertainty range.
 = - Peak outside analysis energy range.
 & - Calculated peak centroid is not close enough to the
 library energy centroid for positive identification.
 P - Peakbackground subtraction
 } - Peak is too close to another for the activity
 to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

***** D I S C A R D E D I S O T O P E P E A K S *****

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
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P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****					
Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
AM-241	2.2781E+04	2.3195E+04	5.9082E+02	1.9623E+03	3.903E+02
CS-137	2.8089E+04	3.6368E+04	7.5082E+02	1.6419E+03	2.483E+02
CO-60	9.2296E+03	4.0489E+04	1.7633E+03	2.3071E+03	7.768E+02


< - MDA value printed.
 A - Activity printed, but activity < MDA.
 B - Activity < MDA and failed test.
 C - Area < Critical level.
 F - Failed fraction or key line test.
 H - Halflife limit exceeded

----- S U M M A R Y -----		
Total Activity (	2.6 to 1998.4 keV)	6.010E+04 pCi/g
Total Decayed Activity (	2.6 to 1998.4 keV)	1.0005228E+05 pCi/g

Analyzed by: _____
 Countroom

Reviewed by: _____
 Supervisor

Laboratory: AAA

 Ortec Gamma		Batch Sample ID	ARS1-B23-01775-03		
		Analytical Batch	ARS1-B23-01775	Analysis Date	9/29/2023 11:33
		Analysis Code	GAM-IG21-SO	SDG	
		Detector	(ARS03) MCB 129	Fraction	
		Count Time (sec)	3600	Run	
		Library	ITSI COUNT.Lib		
		Geometry	250mL tuna can poly 1948-64-2		
Isotope	Activity	Units	CSU	MDA	DL
Am-241	-2.9686E-002	pCi/g	7.7093E-002	1.2900E-001	6.4500E-002
Bi-212	-3.2830E-002	pCi/g	3.0302E-001	4.6900E-001	2.3450E-001
Bi-214	-8.9510E-003	pCi/g	3.2959E-002	1.0500E-001	5.2500E-002
Co-60	8.0943E-003	pCi/g	1.3170E-002	3.2800E-002	1.6400E-002
Cs-137	1.1772E-002	pCi/g	2.7718E-002	4.0500E-002	2.0250E-002
Eu-152	6.3852E-002	pCi/g	4.8968E-002	2.5100E-001	1.2550E-001
Eu-154	6.3764E-002	pCi/g	5.8511E-002	6.5800E-002	3.2900E-002
K-40	-8.8628E-002	pCi/g	3.9123E-001	6.1600E-001	3.0800E-001
Pa-234	4.3594E-002	pCi/g	7.8398E-002	1.4300E-001	7.1500E-002
Pb-210	1.6362E-001	pCi/g	6.4570E-001	9.8200E-001	4.9100E-001
Pb-212	-2.2200E-002	pCi/g	6.1662E-002	1.0700E-001	5.3500E-002
Pb-214	1.1573E-002	pCi/g	6.1100E-002	1.0700E-001	5.3500E-002
Ra-226	-6.1143E-001	pCi/g	5.9618E-001	1.0000E+000	5.0000E-001
Ra-228	4.7797E-002	pCi/g	8.6108E-002	1.2500E-001	6.2500E-002
Tl-208	2.1154E-002	pCi/g	2.8557E-002	3.9400E-002	1.9700E-002
U-235	5.1170E-002	pCi/g	1.4428E-001	2.2000E-001	1.1000E-001
U-238	-4.1961E-001	pCi/g	6.6769E-001	1.1500E+000	5.7500E-001

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 12:34:09 PM
 AAA Spectrum name: ARS03249.An1

Sample description

Batch ID: 23-01775-03
 SDG ID: MBL Tech: SDW

Spectrum Filename: C:\User\ARS03249.An1

Acquisition information

Start time: 9/29/2023 11:33:55 AM
 Live time: 3600
 Real time: 3603
 Dead time: 0.08 %
 Detector ID: 17

Detector system

(ARS03) MCB 129

Calibration

Filename: 1948-64-2 250mL tc poly cal 12-15-17.Clb
 250mL tuna can poly 1948-64-2
 12-15-17 EEC

Energy Calibration

Created: 12/15/2017 11:10:20 AM
 Zero offset: 0.253 keV
 Gain: 0.250 keV/channel
 Quadratic: -1.778E-08 keV/channel^2

Efficiency Calibration

Created: 12/15/2017 12:18:46 PM
 Type: Polynomial
 Uncertainty: 1.552 %
 Coefficients: -0.414479 -4.439273 0.364604
 -0.031228 0.000978 -0.000011

Library Files

Main analysis library: ITSI COUNT.Lib
 Library Match Width: 0.500
 Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G800W064
 Start channel: 10 (2.75keV)
 Stop channel: 8000 (1997.02keV)
 Peak rejection level: 1000.000%
 Peak search sensitivity: 1
 Sample Size: 3.6020E+02 +/- 0.000E+00%
 Activity scaling factor: 1.0000E+06/(1.0000E+00* 3.6020E+02) =
 2.7762E+03
 Detection limit method: Reg. Guide 4.16 Method
 Random error: 1.0000000E+00
 Systematic error: 1.0000000E+00
 Fraction Limit: 0.000%
 Background width: 5
 Half lives decay limit: 12.000

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 12:34:09 PM
 AAA Spectrum name: ARS03249.An1

Activity range factor: 2.000
 Min. step backg. energy 0.000
 Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	NO	
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	ITSI.Pbc 9/21/2023 8:26:46 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 0 cutoff: 0.00E+00 %
 Energy Calibration
 Normalized diff: 0.2827

***** S U M M A R Y O F P E A K S I N R A N G E *****								
Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
37.70	12.	67.40	0.47	2.159E-02				
46.80	61.	22.94	0.55	2.653E-02	46.52	4.000	PBC<MDA	PB210
60.24	4.	201.12	0.89	3.480E-02	59.54	35.900	7.437E-03	Am241
63.36	44.	27.89	0.89	3.649E-02	63.29	3.900	PBC<MDA	U238
77.03	6.	165.09	0.34	4.214E-02				
92.83	78.	17.66	0.47	4.522E-02	92.38	2.570	PBC<MDA	U238
					92.80	3.000	PBC<MDA	U238
94.67	17.	148.39	0.92	4.537E-02	94.67	15.500	PBC<MDA	PA234
98.44	7.	340.83	0.92	4.559E-02	98.44	25.100	PBC<MDA	PA234
111.00	6.	265.20	0.93	4.546E-02	111.00	8.550	PBC<MDA	PA234
119.40	5.	173.21	0.59	4.487E-02				
123.10	15.	115.66	0.94	4.452E-02	123.10	40.460	PBC<MDA	EU154
143.76	8.	177.75	0.96	4.202E-02	143.76	10.500	PBC<MDA	U235
163.35	7.	218.76	0.98	3.932E-02	163.35	4.700	PBC<MDA	U235
171.82	6.	107.62	0.38	3.817E-02				
185.56	37.	35.93	2.03	3.636E-02	186.21	3.640	PBC<MDA	RA226
209.69	10.	87.15	1.02	3.351E-02				
213.15	6.	114.80	1.02	3.312E-02				
226.87	4.	291.94	1.03	3.164E-02	226.87	6.500	PBC<MDA	PA234
238.63	-14.	138.83	1.04	3.050E-02	238.63	43.100	PBC<MDA	PB212
241.98	7.	263.93	1.05	3.019E-02	241.98	7.500	PBC<MDA	PB214
244.67	14.	144.52	1.05	2.995E-02	244.67	7.616	PBC<MDA	EU152
248.04	10.	191.74	1.05	2.965E-02	248.04	6.600	PBC<MDA	EU154
270.86	11.	66.18	0.25	2.777E-02				
277.36	3.	476.77	1.08	2.728E-02	277.36	6.500	PBC<MDA	TL208
295.72	33.	33.71	0.73	2.600E-02	295.21	18.500	PBC<MDA	PB214
301.17	3.	227.22	1.10	2.565E-02	300.09	3.270	PBC<MDA	PB212

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 12:34:09 PM
 AAA Spectrum name: ARS03249.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
303.97	13.	64.31	1.10	2.547E-02				
428.89	2.	186.41	0.29	1.975E-02				
511.08	111.	12.96	2.52	1.742E-02	510.72	22.500	5.899E-01	TL208
569.26	3.	358.95	1.32	1.615E-02	569.26	10.400	PBC<MDA	PA234
583.14	13.	67.42	1.33	1.588E-02	583.14	86.000	PBC<MDA	TL208
591.70	17.	45.75	1.34	1.572E-02	591.70	4.600	PBC<MDA	EU154
609.61	20.	33.01	0.40	1.540E-02	609.31	44.791	PBC<MDA	BI214
661.66	7.	117.72	1.40	1.455E-02	661.66	85.210	PBC<MDA	CS137
678.23	13.	37.04	0.70	1.430E-02				
723.30	6.	165.55	1.45	1.368E-02	723.30	19.700	PBC<MDA	EU154
867.39	18.	37.93	1.56	1.205E-02	867.39	4.176	PBC<MDA	EU152
880.51	6.	117.85	1.58	1.193E-02	880.51	6.500	PBC<MDA	PA234
911.07	8.	90.02	1.60	1.164E-02	911.07	29.000	PBC<MDA	Ra228
946.00	4.	123.99	1.63	1.134E-02	946.00	20.000	PBC<MDA	PA234
964.00	8.	96.82	1.64	1.119E-02	964.00	14.580	PBC<MDA	EU152
					964.60	5.452	PBC<MDA	Ra228
1085.80	4.	106.94	1.74	1.026E-02	1085.80	10.290	PBC<MDA	EU152
1112.07	1.	733.78	1.76	1.008E-02	1112.07	13.580	PBC<MDA	EU152
1119.97	-5.	164.17	1.76	1.003E-02	1120.29	14.797	PBC<MDA	BI214
1173.24	2.	288.68	1.80	9.688E-03	1173.24	99.900	PBC<MDA	CO60
1238.11	2.	450.69	1.85	9.299E-03	1238.11	5.859	PBC<MDA	BI214
1332.50	5.	81.34	1.92	8.781E-03	1332.50	99.982	PBC<MDA	CO60
1394.10	2.	254.42	1.97	8.470E-03	1394.10	3.900	PBC<MDA	PA234
1408.08	5.	84.40	1.98	8.401E-03	1408.08	21.210	PBC<MDA	EU152
1460.75	-4.	220.69	2.02	8.152E-03	1460.75	10.700	PBC<MDA	K40
1620.56	-1.	626.96	2.13	7.464E-03	1620.56	2.750	PBC<MDA	BI212
1763.26	-3.	196.34	2.23	6.917E-03	1764.49	15.357	PBC<MDA	BI214

***** U N I D E N T I F I E D P E A K S U M M A R Y *****
 Peak Centroid Background Net Area Efficiency Uncert FWHM Suspected
 Channel Energy Counts Counts * Area 2 Sigma % keV Nuclide

149.95	37.70	30.	12.	5.696E+02	134.80	0.475	BA-139	
241.13	60.40	46.	1.	3.624E+01	1527.15	0.886	EU-155	
307.43	77.03	40.	6.	1.305E+02	330.19	0.338	PB-212	
477.09	119.40	35.	5.	1.114E+02	346.41	0.589	BA-140	
687.02	171.82	22.	6.	1.677E+02	215.24	0.383	GD-153	
742.06	185.55	53.	37.	1.026E+03	71.86	2.028	U-235	s
838.67	209.37	32.	10.	2.939E+02	174.30	1.018	AC-228	sc
852.54	212.83	19.	6.	1.756E+02	229.60	1.021	NP-237	sc
1083.67	270.86	21.	11.	3.961E+02	132.37	0.251	-	s
1183.23	295.72	30.	33.	1.254E+03	67.42	0.726	PB-214	s
1205.04	301.16	25.	3.	1.256E+02	454.43	1.097	PB-212	sc
1216.24	303.96	28.	13.	5.067E+02	128.63	1.099	SE-75	sD
1716.57	428.89	7.	2.	1.013E+02	372.83	0.286	RH-106	sc
2045.74	511.08	24.	111.	6.372E+03	25.92	2.519	NA-22	

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 12:34:09 PM
 AAA Spectrum name: ARS03249.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected
2715.29	678.23	3.	13.	8.812E+02	74.08	0.702	AG-110M s

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 L - Peak written from unknown list.
 C - Area < Critical level.

 This section based on library: ITSI COUNT.Lib

***** I D E N T I F I E D P E A K S U M M A R Y *****

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma	FWHM % keV
EU-152	157.23	39.52	311.	-14.	-0.004	364.40	0.868s
EU-152	159.64	40.12	297.	-14.	-0.004	356.11	0.868s
EU-154	171.17	43.00	281.	0.	0.000	2000.00	0.871s
EU-152	180.78	45.40	281.	0.	0.000	2000.00	0.873s
PB-210	186.37	46.80	102.	8.	0.002	394.50	0.551s
EU-154	193.99	48.70	274.	0.	0.000	2000.00	0.876
Am-241	237.40	59.54	251.	-18.	-0.005	259.62	0.886s
U-238	252.42	63.29	265.	-29.	-0.008	158.93	0.889
U-238	368.90	92.38	379.	-42.	-0.012	83.81	0.915s
U-238	370.59	92.80	334.	-13.	-0.004	385.34	0.915A
PA-234	378.07	94.67	287.	17.	0.005	296.77	0.917s
PA-234	393.17	98.44	263.	7.	0.002	681.66	0.920s
PA-234	398.22	99.70	297.	-7.	-0.002	732.42	0.921s
PA-234	443.47	111.00	103.	6.	0.002	530.40	0.931s
EU-152	486.63	121.78	144.	-15.	-0.004	237.98	0.941s
EU-154	491.92	123.10	135.	15.	0.004	231.32	0.942s
PA-234	524.68	131.28	84.	-5.	-0.001	563.13	0.949s
U-235	574.65	143.76	89.	8.	0.002	355.50	0.960s
U-235	653.10	163.35	91.	7.	0.002	437.53	0.977s
RA-226	744.65	186.21	170.	-39.	-0.011	97.30	0.997s
U-235	821.14	205.31	212.	-17.	-0.005	242.87	1.014s
PA-234	907.48	226.87	61.	4.	0.001	583.88	1.032s
PB-212	954.57	238.63	193.	-14.	-0.004	277.65	1.043
PB-214	967.99	241.98	186.	7.	0.002	527.87	1.046
EU-152	978.76	244.67	193.	14.	0.004	289.05	1.048s
EU-154	992.26	248.04	193.	10.	0.003	383.49	1.051s
TL-208	1109.68	277.36	59.	3.	0.001	953.53	1.076
PB-214	1181.18	295.21	173.	-6.	-0.002	619.07	1.092s
EU-152	1377.77	344.30	65.	-8.	-0.002	326.44	1.134
TL-208	2044.31	510.72	186.	-28.	-0.008	142.47	2.524
PA-234	2278.79	569.26	37.	3.	0.001	717.90	1.323s
TL-208	2334.38	583.14	25.	13.	0.004	134.85	1.334
EU-154	2368.67	591.70	15.	17.	0.005	91.51	1.342s
BI-214	2439.22	609.31	47.	-6.	-0.002	368.17	1.356s

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 12:34:09 PM
 AAA Spectrum name: ARS03249.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
CS-137	2648.91	661.66	21.	7.	0.002	235.43	1.399s
PA-234	2798.88	699.10	36.	-11.	-0.003	195.32	1.430s
EU-154	2895.82	723.30	43.	6.	0.002	331.11	1.449s
BI-212	2911.32	727.17	52.	-3.	-0.001	923.00	1.452s
PA-234	2934.68	733.00	54.	-7.	-0.002	302.47	1.457s
EU-154	3029.62	756.70	22.	-2.	-0.001	706.32	1.476s
TL-208	3056.06	763.30	26.	-3.	-0.001	510.07	1.482s
BI-214	3076.31	768.36	47.	-5.	-0.001	179.31	1.486s
EU-152	3118.55	778.90	22.	-5.	-0.002	320.41	1.494s
BI-212	3144.67	785.42	25.	-5.	-0.001	244.89	1.499
PA-234	3235.53	808.10	35.	-14.	-0.004	163.18	1.518s
PA-234	3327.67	831.10	29.	-8.	-0.002	252.64	1.536s
TL-208	3445.33	860.47	13.	-1.	0.000	1590.60	1.559s
EU-152	3473.05	867.39	14.	18.	0.005	75.86	1.565s
EU-154	3496.33	873.20	45.	-8.	-0.002	237.14	1.569s
PA-234	3525.61	880.51	22.	6.	0.002	235.70	1.575s
PA-234	3598.08	898.60	23.	-5.	-0.001	257.42	1.590s
Ra-228	3648.04	911.07	14.	8.	0.002	180.04	1.600
PA-234	3710.66	926.70	22.	-1.	0.000	1202.38	1.612s
BI-214	3740.15	934.06	13.	-2.	-0.001	715.61	1.618s
PA-234	3787.98	946.00	9.	4.	0.001	247.98	1.627s
PA-234	3800.00	949.00	15.	-2.	-0.001	741.34	1.629s
EU-152	3860.10	964.00	26.	8.	0.002	193.65	1.641s
EU-154	3989.51	996.30	17.	-4.	-0.001	387.62	1.667s
EU-154	4023.56	1004.80	24.	-9.	-0.002	212.40	1.673s
EU-152	4348.09	1085.80	3.	4.	0.001	213.87	1.736
EU-152	4453.35	1112.07	10.	1.	0.000	1467.57	1.756
BI-214	4486.27	1120.29	23.	-5.	-0.001	328.35	1.762s
CO-60	4698.44	1173.24	7.	2.	0.000	577.35	1.802s
BI-214	4958.38	1238.11	14.	2.	0.000	901.39	1.852s
EU-154	5105.40	1274.80	14.	-6.	-0.002	235.52	1.879s
CO-60	5336.62	1332.50	4.	5.	0.001	162.67	1.922s
BI-214	5517.62	1377.67	4.	-1.	0.000	1468.48	1.955s
PA-234	5583.46	1394.10	4.	2.	0.000	508.84	1.967s
EU-152	5639.49	1408.08	4.	5.	0.001	168.79	1.978s
K-40	5850.56	1460.75	25.	-4.	-0.001	441.38	2.016s
BI-212	6491.04	1620.56	9.	-1.	0.000	1253.91	2.130s
BI-214	7067.93	1764.49	14.	-3.	-0.001	392.68	2.231s

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 A Derived peak area.

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***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****									
- Nuclide -		Average	----- Peak -----						
Name	Code	Activity pCi/g	Energy keV	Activity pCi/g	Code	MDA	Value		
						pCi/g		COMMENTS	
<hr/>									
U-235		5.1170E-02					1.39E+09		
			143.76	3.874E-02	?(	2.203E-01	1.78E+02	1.05E+01	G
			205.31	2.257E-01	+	9.205E-01	1.21E+02	4.70E+00	G
			163.35	7.894E-02	?(	5.319E-01	2.19E+02	4.70E+00	G
RA-226		-6.1143E-01					5.84E+05		
			186.21	6.114E-01	&(P	1.001E+00	4.86E+01	3.64E+00	G K
Ra-228		4.7797E-02					2.10E+03		
			911.07	4.780E-02	?(P	1.253E-01	9.00E+01	2.90E+01	G
			968.90	1.500E-03	% P	3.237E-01	6.07E+03	1.75E+01	G
			338.40	4.429E-03	& P	2.917E-01	2.14E+03	1.20E+01	G
			964.60	1.915E-02	% P	1.029E+00	1.47E+03	5.45E+00	G
Am-241	T	-2.9686E-02					1.58E+05		
			59.54	2.969E-02	&(	1.294E-01	1.30E+02	3.59E+01	G K
PB-210		1.6362E-01					7.45E+03		
			46.52	1.636E-01	(P	9.823E-01	1.97E+02	4.00E+00	G
U-238		-4.1961E-01					1.63E+12		
			63.29	4.196E-01	(P	1.154E+00	7.95E+01	3.90E+00	G
			92.80	2.056E-01	} P	1.350E+00	1.93E+02	3.00E+00	G
			92.38	7.623E-01	} P	1.677E+00	4.19E+01	2.57E+00	G
K-40		-8.8628E-02					4.68E+11		
			1460.75	8.863E-02	?(P	6.162E-01	2.21E+02	1.07E+01	G
PB-214		1.1573E-02					5.84E+05		
			351.92	3.060E-04	%(P	1.071E-01	1.14E+04	3.58E+01	G
			295.21	2.608E-02	+ P	2.770E-01	3.10E+02	1.85E+01	G
			241.98	6.828E-02	?(P	6.096E-01	2.64E+02	7.50E+00	G
BI-214		-8.9510E-03					5.84E+05		
			609.31	1.813E-02	?(P	1.047E-01	1.84E+02	4.48E+01	G
			1764.49	6.515E-02	& P	3.992E-01	1.96E+02	1.54E+01	G
			1120.29	6.854E-02	+ P	3.512E-01	1.64E+02	1.48E+01	G
			1238.11	6.121E-02	?(	7.801E-01	4.51E+02	5.86E+00	G
			768.36	1.623E-01	& P	1.144E+00	8.97E+01	4.80E+00	G
			1377.67	6.966E-02	+ P	7.569E-01	7.34E+02	3.92E+00	G
			934.06	1.083E-01	+	1.166E+00	3.58E+02	3.03E+00	G

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Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
BI-212	-3.2830E-02					2.10E+03	
		727.17-3.283E-02	&(P	4.688E-01	4.61E+02	1.18E+01	G
		1620.56-1.380E-01	+ P	1.723E+00	6.27E+02	2.75E+00	G
		785.42-3.687E-01	+ P	2.082E+00	1.22E+02	2.00E+00	G
PB-212	-2.2200E-02					2.10E+03	
		238.63-2.220E-02	(P	1.070E-01	1.39E+02	4.31E+01	G
		300.09-1.207E-02	& P	1.553E+00	3.79E+03	3.27E+00	G
TL-208	2.1154E-02					2.10E+03	
		583.14 2.039E-02	(P	3.944E-02	6.74E+01	8.60E+01	G
		510.72-1.492E-01	+	3.520E-01	7.12E+01	2.25E+01	G
		860.47-1.146E-02	-	2.777E-01	7.95E+02	1.20E+01	G
		277.36 3.127E-02	?(P	4.538E-01	4.77E+02	6.50E+00	G
		763.30-2.699E-01	+	2.459E+00	2.55E+02	1.70E+00	G
PA-234	4.3594E-02					1.65E+12	
		98.44 1.249E-02	?(P	1.426E-01	3.41E+02	2.51E+01	G
		946.00 3.493E-02	?(	1.548E-01	1.24E+02	2.00E+01	G
		131.28-1.195E-02	+	1.085E-01	2.82E+02	2.00E+01	G
		94.67 4.941E-02	?(P	2.420E-01	1.48E+02	1.55E+01	G
		883.24 7.298E-03	%	3.962E-01	1.49E+03	1.20E+01	G
		926.70-2.306E-02	+	4.079E-01	6.01E+02	1.10E+01	G
		569.26 3.723E-02	?(P	3.854E-01	3.59E+02	1.04E+01	G
		111.00 3.239E-02	?(P	2.681E-01	2.65E+02	8.55E+00	G
		733.00-1.285E-01	+	6.693E-01	1.51E+02	8.50E+00	G
		949.00-4.952E-02	+ P	4.917E-01	3.71E+02	7.80E+00	G
		880.51 1.613E-01	?(	6.605E-01	1.18E+02	6.50E+00	G
		226.87 4.471E-02	?(P	3.950E-01	2.92E+02	6.50E+00	G
		831.10-2.338E-01	+	8.307E-01	1.26E+02	5.60E+00	G
		808.10-4.560E-01	+	1.020E+00	8.16E+01	4.90E+00	G
		99.70-6.366E-02	& P	8.063E-01	3.66E+02	4.70E+00	G
		699.10-3.560E-01	+	9.925E-01	9.77E+01	4.60E+00	G
		898.60-2.172E-01	& P	1.108E+00	1.29E+02	4.00E+00	G
		1394.10 1.085E-01	?(P	7.793E-01	2.54E+02	3.90E+00	G
CS-137	1.1772E-02					1.10E+04	
		661.66 1.177E-02	(	4.047E-02	1.18E+02	8.52E+01	G
CO-60	8.0943E-03					1.93E+03	
		1173.24 3.876E-03	?(	3.276E-02	2.89E+02	9.99E+01	K
		1332.50 1.231E-02	?(	2.742E-02	8.13E+01	1.00E+02	K
EU-152	6.3852E-02					4.64E+03	
		40.12-4.194E-02	&(	2.514E-01	1.78E+02	3.00E+01	G
		121.78-2.331E-02	&	9.347E-02	1.19E+02	2.92E+01	G
		344.30-2.661E-02	+	1.340E-01	1.63E+02	2.70E+01	G

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Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		1408.08	6.082E-02	?(1.380E-01	8.44E+01	2.12E+01 G
		39.52	-7.974E-02	+	4.891E-01	1.82E+02	1.60E+01 G
		964.00	1.022E-01	?(	3.383E-01	9.68E+01	1.46E+01 G
		1112.07	1.218E-02	&(	2.678E-01	7.34E+02	1.36E+01 G
		778.90	-6.669E-02	+	3.059E-01	1.60E+02	1.30E+01 G
		1085.80	7.105E-02	?(	2.231E-01	1.07E+02	1.03E+01 G
		45.40	0.000E+00	&	7.228E-01	1.00E+03	9.00E+00 G
		244.67	1.265E-01	?(	6.167E-01	1.45E+02	7.62E+00 G
		867.39	7.412E-01	?(	8.368E-01	3.79E+01	4.18E+00 G
EU-154	6.3764E-02					3.10E+03	
		123.10	1.688E-02	?(	6.578E-02	1.16E+02	4.05E+01 G
		1274.80	-4.133E-02	+	1.317E-01	1.18E+02	3.55E+01 G
		723.30	4.487E-02	?(	2.579E-01	1.66E+02	1.97E+01 G
		1004.80	-9.598E-02	+	2.775E-01	1.06E+02	1.76E+01 G
		43.00	0.000E+00	-	5.237E-01	1.00E+03	1.31E+01 G
		873.20	-1.292E-01	+	5.244E-01	1.19E+02	1.13E+01 G
		996.30	-7.132E-02	+	3.909E-01	1.94E+02	1.07E+01 G
		42.31	-2.729E-02	%	9.586E-01	1.03E+03	7.30E+00 G
		248.04	1.105E-01	&(	7.178E-01	1.92E+02	6.60E+00 G
		591.70	4.900E-01	?(	5.984E-01	4.58E+01	4.60E+00 G
		48.70	0.000E+00	-	1.431E+00	1.00E+03	4.20E+00 G
		756.70	-9.205E-02	+	9.498E-01	3.53E+02	4.10E+00 G

(- This peak used in the nuclide activity average.

- * - Peak is too wide, but only one peak in library.
- ! - Peak is part of a multiplet and this area went negative during deconvolution.
- ? - Peak is too narrow.
- @ - Peak is too wide at FW25M, but ok at FWHM.
- % - Peak fails sensitivity test.
- \$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
- + - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
- = - Peak outside analysis energy range.
- & - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
- P - Peakbackground subtraction
- } - Peak is too close to another for the activity to be found directly.

Nuclide Codes:

T - Thermal Neutron Activation
 F - Fast Neutron Activation
 I - Fission Product
 N - Naturally Occurring Isotope
 P - Photon Reaction

Peak Codes:

G - Gamma Ray
 X - X-Ray
 P - Positron Decay
 S - Single-Escape
 D - Double-Escape

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C - Charged Particle Reaction K - Key Line
 M - No MDA Calculation A - Not in Average
 R - Coincidence Corrected C - Coincidence Peak
 H - Halflife limit exceeded

***** D I S C A R D E D I S O T O P E P E A K S *****

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma	Activity %
EU-152	39.52	311.	-14.	-0.004	364.40	-7.974E-02
EU-152	40.12	297.	-14.	-0.004	356.11	-4.194E-02
Am-241	59.54	251.	-18.	-0.005	259.62	-2.969E-02
U-238	63.29	265.	-29.	-0.008	158.93	-4.196E-01 P
U-238	92.38	379.	-42.	-0.012	83.81	-7.623E-01 P
U-238	92.80	334.	-13.	-0.004	385.34	-2.056E-01 P
PA-234	94.67	287.	17.	0.005	296.77	4.941E-02 P
PA-234	98.44	263.	7.	0.002	681.66	1.249E-02 P
PA-234	99.70	297.	-7.	-0.002	732.42	-6.366E-02 P
PA-234	111.00	103.	6.	0.002	530.40	3.239E-02 P
EU-152	121.78	144.	-15.	-0.004	237.98	-2.331E-02
EU-154	123.10	135.	15.	0.004	231.32	1.688E-02
PA-234	131.28	84.	-5.	-0.001	563.13	-1.195E-02
U-235	143.76	89.	8.	0.002	355.50	3.874E-02
U-235	163.35	91.	7.	0.002	437.53	7.894E-02
RA-226	186.21	170.	-39.	-0.011	97.30	-6.114E-01 P
U-235	205.31	212.	-17.	-0.005	242.87	-2.257E-01
PA-234	226.87	61.	4.	0.001	583.88	4.471E-02 P
PB-212	238.63	193.	-14.	-0.004	277.65	-2.220E-02 P
PB-214	241.98	186.	7.	0.002	527.87	6.828E-02 P
EU-152	244.67	193.	14.	0.004	289.05	1.265E-01
EU-154	248.04	193.	10.	0.003	383.49	1.105E-01
TL-208	277.36	59.	3.	0.001	953.53	3.127E-02 P
PB-214	295.21	173.	-6.	-0.002	619.07	-2.608E-02 P
EU-152	344.30	65.	-8.	-0.002	326.44	-2.661E-02
TL-208	510.72	186.	-28.	-0.008	142.47	-1.492E-01
PA-234	569.26	37.	3.	0.001	717.90	3.723E-02 P
TL-208	583.14	25.	13.	0.004	134.85	2.039E-02 P
EU-154	591.70	15.	17.	0.005	91.51	4.900E-01
CS-137	661.66	21.	7.	0.002	235.43	1.177E-02
PA-234	699.10	36.	-11.	-0.003	195.32	-3.560E-01
EU-154	723.30	43.	6.	0.002	331.11	4.487E-02
BI-212	727.17	52.	-3.	-0.001	923.00	-3.283E-02 P
PA-234	733.00	54.	-7.	-0.002	302.47	-1.285E-01
EU-154	756.70	22.	-2.	-0.001	706.32	-9.205E-02
TL-208	763.30	26.	-3.	-0.001	510.07	-2.699E-01
EU-152	778.90	22.	-5.	-0.002	320.41	-6.669E-02
BI-212	785.42	25.	-5.	-0.001	244.89	-3.687E-01 P
PA-234	808.10	35.	-14.	-0.004	163.18	-4.560E-01
PA-234	831.10	29.	-8.	-0.002	252.64	-2.338E-01
TL-208	860.47	13.	-1.	0.000	1590.60	-1.146E-02

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Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-152	867.39	14.	18.	0.005	75.86	7.412E-01	
EU-154	873.20	45.	-8.	-0.002	237.14	-1.292E-01	
PA-234	880.51	22.	6.	0.002	235.70	1.613E-01	
PA-234	898.60	23.	-5.	-0.001	257.42	-2.172E-01	P
Ra-228	911.07	14.	8.	0.002	180.04	4.780E-02	P
PA-234	926.70	22.	-1.	0.000	1202.38	-2.306E-02	
PA-234	946.00	9.	4.	0.001	247.98	3.493E-02	
PA-234	949.00	15.	-2.	-0.001	741.34	-4.952E-02	P
EU-152	964.00	26.	8.	0.002	193.65	1.022E-01	
EU-154	996.30	17.	-4.	-0.001	387.62	-7.132E-02	
EU-154	1004.80	24.	-9.	-0.002	212.40	-9.598E-02	
EU-152	1085.80	3.	4.	0.001	213.87	7.105E-02	
EU-152	1112.07	10.	1.	0.000	1467.57	1.218E-02	
CO-60	1173.24	7.	2.	0.000	577.35	3.876E-03	
EU-154	1274.80	14.	-6.	-0.002	235.52	-4.133E-02	
CO-60	1332.50	4.	5.	0.001	162.67	1.231E-02	
PA-234	1394.10	4.	2.	0.000	508.84	1.085E-01	P
EU-152	1408.08	4.	5.	0.001	168.79	6.082E-02	
K-40	1460.75	25.	-4.	-0.001	441.38	-8.863E-02	P
BI-212	1620.56	9.	-1.	0.000	1253.91	-1.380E-01	P

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
U-235 #A	5.1170E-02	1.4423E-01	1.4428E-01	0.220E+00
RA-226 #A	-6.1143E-01	5.9491E-01	5.9618E-01	0.100E+01
Ra-228 #A	4.7797E-02	8.6055E-02	8.6108E-02	0.125E+00
Am-241 #A	-2.9686E-02	7.7070E-02	7.7093E-02	0.129E+00
PB-210 A	1.6362E-01	6.4550E-01	6.4570E-01	0.982E+00
U-238 #A	-4.1961E-01	6.6691E-01	6.6769E-01	0.115E+01
K-40 #A	-8.8628E-02	3.9119E-01	3.9123E-01	0.616E+00
PB-214 #A	1.1573E-02	6.1092E-02	6.1100E-02	0.107E+00
BI-214 #A	-8.9510E-03	3.2955E-02	3.2959E-02	0.105E+00
BI-212 #A	-3.2830E-02	3.0302E-01	3.0302E-01	0.469E+00
PB-212 #A	-2.2200E-02	6.1639E-02	6.1662E-02	0.107E+00
TL-208 #A	2.1154E-02	2.8526E-02	2.8557E-02	0.394E-01
PA-234 #A	4.3594E-02	7.8332E-02	7.8398E-02	0.143E+00
CS-137 #A	1.1772E-02	2.7714E-02	2.7718E-02	0.405E-01
CO-60 #A	8.0943E-03	1.3167E-02	1.3170E-02	0.328E-01
EU-152 #A	6.3852E-02	4.8440E-02	4.8968E-02	0.251E+00
EU-154 #A	6.3764E-02	5.8349E-02	5.8511E-02	0.658E-01

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 12:34:09 PM
AAA Spectrum name: ARS03249.An1


- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

----- S U M M A R Y -----
Total Activity (2.8 to 1997.0 keV) 0.000E+00 pCi/g

Analyzed by: _____
Countroom

Reviewed by: _____
Supervisor

Laboratory: AAA

 Ortec Gamma		Batch Sample ID	ARS1-B23-01775-04		
		Analytical Batch	ARS1-B23-01775	Analysis Date	9/29/2023 09:23
		Analysis Code	GAM-IG21-SO	SDG	ARS1-23-01973
		Detector	ARS06 MCB 133	Fraction	001
		Count Time (sec)	3600	Run	1
		Library	ITSI COUNT.Lib		
		Geometry	2275-19-5 250mL tc poly		
Isotope	Activity	Units	CSU	MDA	DL
Am-241	8.3861E-002	pCi/g	1.5947E-001	2.6400E-001	1.3200E-001
Bi-212	1.3902E-001	pCi/g	2.5771E-001	4.6100E-001	2.3050E-001
Bi-214	3.9364E-001	pCi/g	7.6764E-002	5.8200E-002	2.9100E-002
Co-60	8.9171E-003	pCi/g	2.5456E-002	4.6500E-002	2.3250E-002
Cs-137	-2.1490E-002	pCi/g	3.9087E-002	5.1500E-002	2.5750E-002
Eu-152	3.7348E-001	pCi/g	4.4316E-001	7.9600E-001	3.9800E-001
Eu-154	1.7122E-001	pCi/g	2.6899E-001	1.0300E-001	5.1500E-002
K-40	1.0494E+001	pCi/g	1.0748E+000	1.8700E-001	9.3500E-002
Pa-234	5.4157E-002	pCi/g	8.4514E-002	2.0100E-001	1.0050E-001
Pb-210	9.2542E-001	pCi/g	3.0516E+000	5.0500E+000	2.5250E+000
Pb-212	3.0233E-001	pCi/g	8.1072E-002	1.1700E-001	5.8500E-002
Pb-214	4.0624E-001	pCi/g	7.2129E-002	5.4600E-002	2.7300E-002
Ra-226	8.1443E-001	pCi/g	3.7927E-001	5.1900E-001	2.5950E-001
Ra-228	3.9732E-001	pCi/g	7.5962E-002	9.1000E-002	4.5500E-002
Tl-208	9.6852E-002	pCi/g	3.7045E-002	4.0200E-002	2.0100E-002
U-235	-1.0703E-001	pCi/g	2.1664E-001	3.6000E-001	1.8000E-001
U-238	5.1876E-001	pCi/g	1.3939E+000	2.3100E+000	1.1550E+000

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 10:23:44 AM
 AAA Spectrum name: ARS06051.An1

Sample description

Batch ID: 23-01775-04
 SDG ID: ARS1-23-01973-001 Tech: SDW

Spectrum Filename: C:\User\ARS06051.An1

Acquisition information

Start time: 9/29/2023 9:23:34 AM
 Live time: 3600
 Real time: 3603
 Dead time: 0.09 %
 Detector ID: 21

Detector system

ARS06 MCB 133

Calibration

Filename: 2275-19-5 250mL tc poly cal 12-8-21.Clb
 2275-19-5 250mL tc poly
 12-8-21 EEC

Energy Calibration

Created: 12/8/2021 10:48:48 AM
 Zero offset: 0.100 keV
 Gain: 0.250 keV/channel
 Quadratic: $-3.095E-08 \text{ keV/channel}^2$

Efficiency Calibration

Created: 12/8/2021 11:58:07 AM
 Type: Polynomial
 Uncertainty: 1.254 %
 Coefficients: -0.502841 -4.041766 0.314910
 -0.026798 0.000803 -0.000009

Library Files

Main analysis library: ITSI COUNT.Lib
 Library Match Width: 0.500
 Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G800W064
 Start channel: 10 (2.60keV)
 Stop channel: 8000 (1998.39keV)
 Peak rejection level: 1000.000%
 Peak search sensitivity: 1
 Sample Size: $4.1599E+02 \pm 0.000E+00\%$
 Activity scaling factor: $1.0000E+06 / (1.0000E+00 * 4.1599E+02) = 2.4039E+03$
 Detection limit method: Reg. Guide 4.16 Method
 Random error: 1.0000000E+00
 Systematic error: 1.0000000E+00
 Fraction Limit: 0.000%
 Background width: 5
 Half lives decay limit: 12.000

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 10:23:44 AM
 AAA Spectrum name: ARS06051.An1

Activity range factor: 2.000
 Min. step backg. energy 0.000
 Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	NO	
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	ITSI.Pbc 9/21/2023 8:04:04 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 0 cutoff: 0.00E+00 %
 Energy Calibration
 Normalized diff: 0.1204

***** S U M M A R Y O F P E A K S I N R A N G E *****									
Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc	
12.09	268.	13.58	1.28	1.377E-03					
20.86	441.	13.90	1.32	8.369E-03					
27.78	232.	21.72	1.57	1.389E-02					
36.39	227.	22.86	0.50	2.075E-02					
39.52	158.	59.07	0.98	2.325E-02	39.52	16.000	PBC<MDA	EU152	
40.12	58.	162.20	0.98	2.373E-02	40.12	30.000	PBC<MDA	EU152	
42.24	153.	27.67	0.98	2.541E-02	42.31	7.300	1.488E+00	EU154	
					43.00	13.100	8.118E-01	EU154	
45.34	23.	169.66	0.99	2.789E-02	45.40	9.000	1.618E-01	EU152	
46.84	19.	188.20	0.99	2.898E-02	46.52	4.000	3.000E-01	PB210	
48.70	59.	165.44	0.99	3.063E-02	48.70	4.200	PBC<MDA	EU154	
50.22	13.	227.34	0.99	3.196E-02					
56.01	229.	18.31	1.48	3.698E-02					
59.54	66.	95.03	1.00	3.968E-02	59.54	35.900	PBC<MDA	Am241	
63.15	16.	179.84	0.49	4.231E-02	63.29	3.900	1.746E-01	U238	
74.80	178.	17.09	1.02	4.897E-02					
77.15	278.	11.11	1.02	4.996E-02					
87.42	130.	24.89	1.29	5.304E-02					
98.44	38.	120.01	1.05	5.457E-02	98.44	25.100	PBC<MDA	PA234	
105.76	19.	116.43	0.35	5.481E-02					
111.36	10.	167.72	1.06	5.470E-02	111.00	8.550	3.703E-02	PA234	
127.61	9.	160.63	0.00	5.339E-02					
139.96	42.	40.18	0.97	5.182E-02					
165.97	38.	42.27	1.51	4.801E-02					
176.75	22.	65.45	0.56	4.641E-02					
186.07	74.	23.11	0.95	4.507E-02	186.21	3.640	8.144E-01	RA226	
210.68	10.	130.70	0.21	4.178E-02					

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 10:23:44 AM
 AAA Spectrum name: ARS06051.An1

pk	energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
238.45	311.	7.14	1.21	3.855E-02	238.63	43.100	3.377E-01	PB212	
241.89	68.	25.41	1.21	3.819E-02	241.98	7.500	4.283E-01	PB214	
274.30	15.	58.80	1.25	3.506E-02					
279.89	11.	98.23	1.25	3.458E-02					
295.15	166.	11.74	0.93	3.335E-02	295.21	18.500	4.845E-01	PB214	
299.98	31.	35.76	1.28	3.297E-02	300.09	3.270	PBC<MDA	PB212	
309.06	6.	126.26	0.56	3.230E-02					
338.26	97.	15.96	1.12	3.035E-02	338.40	12.010	4.785E-01	Ra228	
348.24	20.	45.79	1.33	2.975E-02					
351.81	221.	7.85	1.33	2.954E-02	351.92	35.800	3.765E-01	PB214	
374.17	10.	68.40	0.72	2.830E-02					
392.88	28.	38.80	2.24	2.736E-02					
484.03	3.	177.59	0.24	2.371E-02					
510.76	195.	11.93	2.55	2.285E-02	510.72	22.500	6.845E-01	TL208	
569.26	4.	330.50	1.56	2.121E-02	569.26	10.400	PBC<MDA	PA234	
583.45	108.	16.78	1.08	2.085E-02	583.14	86.000	1.086E-01	TL208	
591.70	14.	78.48	1.59	2.065E-02	591.70	4.600	PBC<MDA	EU154	
609.49	202.	9.29	1.46	2.024E-02	609.31	44.791	4.013E-01	BI214	
647.27	14.	42.23	0.73	1.941E-02					
688.48	19.	49.76	0.67	1.860E-02					
712.61	17.	53.30	0.32	1.816E-02					
723.30	17.	86.41	1.72	1.797E-02	723.30	19.700	PBC<MDA	EU154	
727.17	17.	92.64	1.72	1.790E-02	727.17	11.800	PBC<MDA	BI212	
733.00	3.	540.73	1.73	1.780E-02	733.00	8.500	PBC<MDA	PA234	
756.70	13.	107.31	1.75	1.740E-02	756.70	4.100	PBC<MDA	EU154	
764.84	0.	591.61	0.22	1.727E-02	763.30	1.700	3.069E-02	TL208	
768.36	7.	235.16	1.76	1.722E-02	768.36	4.799	PBC<MDA	BI214	
778.90	8.	184.40	1.77	1.705E-02	778.90	12.990	PBC<MDA	EU152	
860.66	15.	109.75	1.85	1.587E-02	860.47	12.000	PBC<MDA	TL208	
911.26	84.	14.06	1.65	1.521E-02	911.07	29.000	3.452E-01	Ra228	
932.96	14.	100.37	1.92	1.493E-02	934.06	3.029	PBC<MDA	BI214	
946.00	13.	77.94	1.93	1.479E-02	946.00	20.000	PBC<MDA	PA234	
964.00	5.	343.84	1.95	1.458E-02	964.00	14.580	PBC<MDA	EU152	
					964.60	5.452	1.059E-01	Ra228	
964.89	12.	120.78	1.95	1.458E-02	964.00	14.580	PBC<MDA	EU152	
					964.60	5.452	2.668E-01	Ra228	
969.31	51.	20.85	2.42	1.452E-02	968.90	17.460	3.600E-01	Ra228	
1076.42	2.	162.16	0.00	1.339E-02					
1108.35	11.	44.17	0.68	1.309E-02					
1120.37	66.	24.31	2.21	1.297E-02	1120.29	14.797	6.186E-01	BI214	
1173.24	9.	142.72	2.14	1.250E-02	1173.24	99.900	PBC<MDA	CO60	
1236.76	13.	108.84	2.19	1.195E-02	1238.11	5.859	PBC<MDA	BI214	
1332.50	3.	327.62	2.27	1.122E-02	1332.50	99.982	PBC<MDA	CO60	
1377.85	17.	36.43	0.47	1.089E-02	1377.67	3.919	7.019E-01	BI214	
1394.10	1.	933.27	2.32	1.078E-02	1394.10	3.900	PBC<MDA	PA234	
1408.08	1.	697.62	2.33	1.068E-02	1408.08	21.210	PBC<MDA	EU152	
1461.03	642.	3.99	1.75	1.032E-02	1460.75	10.700	1.049E+01	K40	
1496.32	8.	45.55	0.46	1.010E-02					

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 10:23:44 AM
 AAA Spectrum name: ARS06051.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1602.12	15.	25.82	0.94	9.456E-03				
1620.56	1.	627.11	2.49	9.350E-03	1620.56	2.750	PBC<MDA	BI212
1728.03	20.	22.36	0.37	8.762E-03				
1764.27	41.	15.62	2.56	8.575E-03	1764.49	15.357	4.845E-01	BI214

***** U N I D E N T I F I E D P E A K S U M M A R Y *****

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma	FWHM %	Suspected Nuclide
47.96	12.09	462.	268.	1.949E+05	27.16	1.279	- s
83.02	20.86	1326.	441.	5.269E+04	27.79	1.319	- s
110.70	27.78	965.	232.	1.673E+04	43.44	1.568	- s
145.13	36.39	1023.	227.	1.092E+04	45.72	0.503	- s
168.57	42.23	824.	153.	6.033E+03	55.37	0.983	- sD
180.98	45.33	721.	21.	7.692E+02	356.68	0.986	- sc
200.50	50.21	452.	14.	4.276E+02	443.36	0.992	- sc
223.63	56.12	564.	229.	6.181E+03	36.63	1.484	- s
298.78	74.88	374.	178.	3.636E+03	34.17	1.021	- sD
308.18	77.23	339.	278.	5.567E+03	22.23	1.024	- D
349.23	87.42	350.	130.	2.443E+03	49.78	1.287	- sM
422.59	105.66	196.	19.	3.466E+02	232.87	0.345	- sc
445.00	111.36	131.	10.	1.755E+02	335.45	0.000	- sc
510.00	127.61	100.	9.	1.686E+02	321.26	0.000	- sc
559.41	139.96	109.	42.	8.066E+02	80.35	0.975	- s
663.43	165.89	86.	38.	7.810E+02	84.54	1.514	- s
706.58	176.75	84.	22.	4.848E+02	130.90	0.561	- s
842.29	210.68	70.	10.	2.298E+02	261.41	0.208	- sc
1096.79	274.34	32.	15.	4.327E+02	117.61	1.249	- sD
1119.15	279.93	56.	11.	3.261E+02	196.46	1.255	- sc
1235.85	309.06	26.	6.	1.826E+02	252.51	0.556	- sc
1391.74	348.14	26.	20.	6.708E+02	85.07	1.330	- sD
1496.33	374.17	21.	10.	3.639E+02	136.79	0.721	- sc
1571.21	392.88	30.	28.	1.023E+03	77.59	2.236	- s
1935.93	484.03	10.	3.	1.097E+02	355.18	0.236	- sc
2589.17	647.27	7.	14.	7.108E+02	84.46	0.730	- s
2754.07	688.48	22.	19.	1.022E+03	99.53	0.674	- s
2850.67	712.61	21.	17.	9.363E+02	106.60	0.321	- s
3059.69	764.84	41.	2.	1.445E+02	736.75	1.761	- sc
4307.00	1076.42	4.	2.	1.344E+02	324.32	0.000	- sc
4434.83	1108.35	5.	11.	8.253E+02	88.35	0.678	- s
5514.03	1377.85	5.	17.	1.524E+03	72.87	0.474	- sM
5988.49	1496.32	2.	8.	8.022E+02	91.09	0.461	- s
6412.30	1602.12	0.	15.	1.586E+03	51.64	0.936	- s
6916.71	1728.03	0.	20.	2.282E+03	44.72	0.374	- s

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 10:23:44 AM
 AAA Spectrum name: ARS06051.An1

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 L - Peak written from unknown list.
 C - Area < Critical level.
 M - Peak is close to a library peak.

 This section based on library: ITSI COUNT.Lib

***** I D E N T I F I E D P E A K S U M M A R Y *****							
Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
EU-152	157.66	39.52	4303.	158.	0.044	118.14	0.980s
EU-152	160.06	40.12	4461.	58.	0.016	324.41	0.980
EU-154	168.82	42.31	4520.	59.	0.016	325.63	0.983
EU-154	171.58	43.00	4578.	59.	0.016	327.43	0.984s
EU-152	181.18	45.40	4637.	59.	0.016	328.62	0.986s
PB-210	185.66	46.52	4679.	59.	0.016	329.61	0.988s
EU-154	194.38	48.70	4738.	59.	0.016	330.88	0.990s
Am-241	237.73	59.54	1946.	66.	0.018	190.05	1.003
U-238	252.73	63.29	2014.	48.	0.013	268.59	1.008s
U-238	369.09	92.38	1197.	-39.	-0.011	253.16	1.041
U-238	370.77	92.80	1236.	-39.	-0.011	257.04	1.042
PA-234	378.24	94.67	1275.	-39.	-0.011	260.50	1.044s
PA-234	393.32	98.44	1037.	38.	0.011	240.02	1.048s
PA-234	398.36	99.70	1118.	-37.	-0.010	259.16	1.050s
PA-234	443.56	111.00	441.	-19.	-0.005	312.78	1.063s
EU-152	486.68	121.78	689.	-8.	-0.002	886.79	1.076s
PA-234	524.68	131.28	450.	-5.	-0.001	1203.33	1.087
U-235	574.60	143.76	506.	-32.	-0.009	202.30	1.101s
U-235	652.96	163.35	342.	-28.	-0.008	189.14	1.123s
RA-226	743.84	186.07	91.	74.	0.021	46.22	0.952
U-235	820.81	205.31	204.	-12.	-0.003	383.14	1.171
PB-212	954.10	238.63	510.	278.	0.077	25.90	1.209
PB-214	967.51	241.98	114.	69.	0.019	50.11	1.212D
EU-152	978.26	244.67	788.	0.	0.000	2000.00	1.216s
TL-208	1109.04	277.36	232.	-24.	-0.007	187.18	1.252
PB-214	1180.46	295.21	49.	155.	0.043	20.56	1.272D
PB-212	1199.97	300.09	48.	31.	0.009	71.52	1.277D
Ra-228	1352.70	338.26	50.	97.	0.027	31.92	1.124
EU-152	1376.85	344.30	478.	-22.	-0.006	280.57	1.326
PB-214	1407.34	351.92	39.	221.	0.061	15.69	1.334D
TL-208	2042.88	510.76	63.	195.	0.054	23.87	2.548s
PA-234	2276.97	569.26	61.	4.	0.001	661.00	1.565s
TL-208	2332.51	583.14	64.	90.	0.025	37.74	1.579s
EU-154	2366.77	591.70	32.	14.	0.004	156.96	1.588s
BI-214	2437.98	609.49	32.	202.	0.056	18.58	1.461

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 10:23:44 AM
 AAA Spectrum name: ARS06051.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
CS-137	2646.75	661.66	88.	-19.	-0.005	181.84	1.659s
PA-234	2796.59	699.10	71.	-9.	-0.003	333.04	1.696s
EU-154	2893.44	723.30	104.	17.	0.005	172.82	1.720s
BI-212	2908.93	727.17	121.	17.	0.005	185.28	1.724
PA-234	2932.26	733.00	137.	3.	0.001	1081.46	1.730s
EU-154	3027.12	756.70	96.	13.	0.004	214.61	1.753s
TL-208	3053.54	763.30	104.	13.	0.004	221.95	1.760s
BI-214	3073.77	768.36	118.	7.	0.002	470.31	1.764s
EU-152	3115.98	778.90	94.	8.	0.002	368.80	1.775s
BI-212	3142.07	785.42	110.	-6.	-0.002	535.48	1.781s
PA-234	3232.85	808.10	50.	-2.	-0.001	1114.30	1.803s
PA-234	3324.91	831.10	43.	-5.	-0.001	481.00	1.825
TL-208	3442.48	860.47	128.	15.	0.004	219.49	1.853s
EU-152	3470.18	867.39	143.	0.	0.000	2000.00	1.859s
EU-154	3493.43	873.20	143.	0.	0.000	2000.00	1.865
PA-234	3522.70	880.51	143.	0.	0.000	2000.00	1.872s
PA-234	3533.62	883.24	143.	0.	0.000	2000.00	1.874s
PA-234	3595.11	898.60	54.	-14.	-0.004	203.54	1.889s
Ra-228	3645.79	911.26	18.	84.	0.023	28.11	1.652
PA-234	3707.60	926.70	75.	-3.	-0.001	774.60	1.915
BI-214	3737.06	934.06	88.	14.	0.004	200.75	1.922s
PA-234	3784.86	946.00	44.	13.	0.004	155.89	1.933s
PA-234	3796.87	949.00	61.	-4.	-0.001	574.95	1.936s
EU-152	3856.92	964.00	126.	5.	0.001	687.68	1.949s
Ra-228	3859.32	964.60	95.	12.	0.003	241.55	1.950s
Ra-228	3876.53	968.90	21.	60.	0.017	33.52	1.954D
EU-154	3986.22	996.30	34.	-5.	-0.001	441.45	1.979s
EU-154	4020.25	1004.80	53.	-18.	-0.005	161.15	1.987s
EU-152	4344.54	1085.80	61.	-11.	-0.003	284.34	2.059s
EU-152	4449.72	1112.07	162.	-14.	-0.004	269.88	2.082
BI-214	4482.96	1120.37	35.	66.	0.018	48.62	2.211
CO-60	4694.64	1173.24	40.	9.	0.002	285.45	2.135s
BI-214	4954.40	1238.11	48.	13.	0.004	217.68	2.190s
EU-154	5101.33	1274.80	36.	-9.	-0.002	271.62	2.221s
CO-60	5332.40	1332.50	24.	3.	0.001	655.24	2.268s
PA-234	5579.09	1394.10	21.	1.	0.000	1866.55	2.318s
EU-152	5635.08	1408.08	17.	1.	0.000	1395.23	2.329s
K-40	5847.15	1461.03	4.	642.	0.178	7.99	1.745s
BI-212	6486.16	1620.56	18.	1.	0.000	1254.22	2.491s
BI-214	7062.79	1764.49	24.	19.	0.005	112.74	2.594

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 A Derived peak area.

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 10:23:44 AM
 AAA Spectrum name: ARS06051.An1

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****									
- Nuclide -		Average	----- Peak -----						
Name	Code	Activity pCi/g	Energy keV	Activity pCi/g	Code	MDA	Value		
								COMMENTS	
U-235		-1.0703E-01					1.39E+09		
			143.76	1.070E-01	?(	3.603E-01	1.01E+02	1.05E+01	G
			205.31	1.121E-01	+	6.269E-01	1.92E+02	4.70E+00	G
			163.35	2.239E-01	+	7.053E-01	9.46E+01	4.70E+00	G
RA-226		8.1443E-01					5.84E+05		
			186.21	8.144E-01	(	5.191E-01	2.31E+01	3.64E+00	G K
Ra-228		3.9732E-01					2.10E+03		
			911.07	3.452E-01	(	9.105E-02	1.41E+01	2.90E+01	G
			968.90	4.281E-01	(	1.704E-01	1.68E+01	1.75E+01	G
			338.40	4.785E-01	(	1.773E-01	1.60E+01	1.20E+01	G
			964.60	2.668E-01	-	1.092E+00	1.21E+02	5.45E+00	G
Am-241	T	8.3861E-02					1.58E+05		
			59.54	8.386E-02	?(	2.638E-01	9.50E+01	3.59E+01	G K
PB-210		9.2542E-01					7.45E+03		
			46.52	9.254E-01	&(	5.052E+00	1.65E+02	4.00E+00	G
U-238		5.1876E-01					1.63E+12		
			63.29	5.188E-01	?(	2.312E+00	1.34E+02	3.90E+00	G
			92.80	4.344E-01	+	1.855E+00	1.29E+02	3.00E+00	G
			92.38	5.073E-01	+	2.134E+00	1.27E+02	2.57E+00	G
K-40		1.0494E+01					4.68E+11		
			1460.75	1.049E+01	(	1.867E-01	3.99E+00	1.07E+01	G
PB-214		4.0624E-01					5.84E+05		
			351.92	3.765E-01	(	5.460E-02	7.85E+00	3.58E+01	G
			295.21	4.526E-01	(	1.035E-01	1.03E+01	1.85E+01	G
			241.98	4.337E-01	(	3.310E-01	2.51E+01	7.50E+00	G
BI-214		3.9364E-01					5.84E+05		
			609.31	4.013E-01	(	5.819E-02	9.29E+00	4.48E+01	G
			1764.49	2.597E-01	- P	3.504E-01	5.64E+01	1.54E+01	G
			1120.29	6.186E-01	+	2.854E-01	2.43E+01	1.48E+01	G
			1238.11	3.351E-01	&(	9.021E-01	1.09E+02	5.86E+00	G
			768.36	1.449E-01	-	1.167E+00	2.35E+02	4.80E+00	G
			1377.67	2.537E-02	%	1.108E+00	1.19E+03	3.92E+00	G
			934.06	5.466E-01	&	1.849E+00	1.00E+02	3.03E+00	G

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Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
BI-212	1.3902E-01					2.10E+03	
		727.17	1.485E-01	?(	4.610E-01	9.26E+01	1.18E+01 G
		1620.56	9.826E-02	&(	1.562E+00	6.27E+02	2.75E+00 G
		785.42-2.982E-01		&	2.742E+00	2.68E+02	2.00E+00 G
PB-212	3.0233E-01					2.10E+03	
		238.63	3.023E-01	?(	1.173E-01	1.29E+01	4.31E+01 G
		300.09	5.266E-01	+	5.833E-01	3.58E+01	3.27E+00 G
TL-208	9.6852E-02					2.10E+03	
		583.14	9.053E-02	?(	4.023E-02	1.89E+01	8.60E+01 G
		510.72	6.845E-01	+	1.394E-01	1.19E+01	2.25E+01 G
		860.47	1.422E-01	?(	5.254E-01	1.10E+02	1.20E+01 G
		277.36-1.883E-01		-	5.882E-01	9.36E+01	6.50E+00 G
		763.30	8.231E-01	+	3.083E+00	1.11E+02	1.70E+00 G
PA-234	5.4157E-02					1.65E+12	
		98.44	5.046E-02	?(	2.013E-01	1.20E+02	2.51E+01 G
		946.00	7.869E-02	?(	2.053E-01	7.79E+01	2.00E+01 G
		131.28-8.520E-03		-	1.731E-01	6.02E+02	2.00E+01 G
		94.67-8.387E-02		+	3.631E-01	1.30E+02	1.55E+01 G
		883.24	0.000E+00	-	5.645E-01	1.00E+03	1.20E+01 G
		926.70-3.495E-02		-	4.709E-01	3.87E+02	1.10E+01 G
		569.26	3.436E-02	?(	3.194E-01	3.30E+02	1.04E+01 G
		111.00-7.407E-02		+	3.881E-01	1.56E+02	8.55E+00 G
		733.00	3.671E-02	&(	6.828E-01	5.41E+02	8.50E+00 G
		949.00-6.114E-02		+	6.126E-01	2.87E+02	7.80E+00 G
		880.51	0.000E+00	-	1.040E+00	1.00E+03	6.50E+00 G
		226.87-8.364E-03		%	4.363E-01	1.76E+03	6.50E+00 G
		831.10-1.030E-01		+	6.602E-01	2.40E+02	5.60E+00 G
		808.10-5.323E-02		&	7.938E-01	5.57E+02	4.90E+00 G
		99.70-2.585E-01		&	1.114E+00	1.30E+02	4.70E+00 G
		699.10-2.004E-01		+	8.974E-01	1.67E+02	4.60E+00 G
		898.60-4.109E-01		+	1.085E+00	1.02E+02	4.00E+00 G
		1394.10	4.294E-02	?(	1.033E+00	9.33E+02	3.90E+00 G
CS-137	-2.1490E-02					1.10E+04	
		661.66-2.149E-02		?(	5.154E-02	9.09E+01	8.52E+01 G
CO-60	8.9171E-03					1.93E+03	
		1173.24	1.301E-02	?(	4.652E-02	1.43E+02	9.99E+01 K
		1332.50	4.827E-03	?(	4.109E-02	3.28E+02	1.00E+02 K
EU-152	3.7348E-01					4.64E+03	
		40.12	1.481E-01	?(	7.959E-01	1.62E+02	3.00E+01 G
		121.78-9.603E-03		-	1.430E-01	4.43E+02	2.92E+01 G
		344.30-4.973E-02		&	2.333E-01	1.40E+02	2.70E+01 G

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Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		1408.08	9.561E-03	-	1.738E-01	6.98E+02	2.12E+01 G
		39.52	7.688E-01	?(	1.496E+00	5.91E+01	1.60E+01 G
		964.00	3.960E-02	-	4.675E-01	3.44E+02	1.46E+01 G
		1112.07	1.385E-01	-	6.308E-01	1.35E+02	1.36E+01 G
		778.90	6.193E-02	-	3.910E-01	1.84E+02	1.30E+01 G
		1085.80	1.424E-01	-	5.148E-01	1.42E+02	1.03E+01 G
		45.40	4.219E-01	?(	2.297E+00	1.64E+02	9.00E+00 G
		244.67	0.000E+00	-	8.350E-01	1.00E+03	7.62E+00 G
		867.39	0.000E+00	-	1.601E+00	1.00E+03	4.18E+00 G
EU-154	1.7122E-01					3.10E+03	
		123.10	4.936E-11	%(	1.030E-01	6.19E+10	4.05E+01 G
		1274.80	3.925E-02	+	1.338E-01	1.36E+02	3.55E+01 G
		723.30	8.842E-02	?(	2.557E-01	8.64E+01	1.97E+01 G
		1004.80	1.321E-01	+	2.663E-01	8.06E+01	1.76E+01 G
		43.00	3.104E-01	?(	1.683E+00	1.64E+02	1.31E+01 G
		873.20	0.000E+00	&	5.945E-01	1.00E+03	1.13E+01 G
		996.30	6.166E-02	+	3.553E-01	2.21E+02	1.07E+01 G
		42.31	5.685E-01	?(	3.066E+00	1.63E+02	7.30E+00 G
		248.04	6.554E-03	%	9.609E-01	4.36E+03	6.60E+00 G
		591.70	2.570E-01	?(	5.522E-01	7.85E+01	4.60E+00 G
		48.70	8.279E-01	?(	4.537E+00	1.65E+02	4.20E+00 G
		756.70	3.379E-01	?(	1.224E+00	1.07E+02	4.10E+00 G

(- This peak used in the nuclide activity average.

- * - Peak is too wide, but only one peak in library.
- ! - Peak is part of a multiplet and this area went negative during deconvolution.
- ? - Peak is too narrow.
- @ - Peak is too wide at FW25M, but ok at FWHM.
- % - Peak fails sensitivity test.
- \$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
- + - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
- = - Peak outside analysis energy range.
- & - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
- P - Peakbackground subtraction
- } - Peak is too close to another for the activity to be found directly.

Nuclide Codes:

T - Thermal Neutron Activation
 F - Fast Neutron Activation
 I - Fission Product
 N - Naturally Occurring Isotope
 P - Photon Reaction

Peak Codes:

G - Gamma Ray
 X - X-Ray
 P - Positron Decay
 S - Single-Escape
 D - Double-Escape

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 AAA Spectrum name: ARS06051.An1

C - Charged Particle Reaction K - Key Line
 M - No MDA Calculation A - Not in Average
 R - Coincidence Corrected C - Coincidence Peak
 H - Halflife limit exceeded

***** D I S C A R D E D I S O T O P E P E A K S *****

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
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EU-152	39.52	4303.	158.	0.044	118.14	7.688E-01
EU-152	40.12	4461.	58.	0.016	324.41	1.481E-01
EU-152	45.40	4637.	59.	0.016	328.62	4.219E-01
Am-241	59.54	1946.	66.	0.018	190.05	8.386E-02
PA-234	94.67	1275.	-39.	-0.011	260.50	-8.387E-02
PA-234	98.44	1037.	38.	0.011	240.02	5.046E-02
PA-234	99.70	1118.	-37.	-0.010	259.16	-2.585E-01
PA-234	111.00	441.	-19.	-0.005	312.78	-7.407E-02
EU-152	121.78	689.	-8.	-0.002	886.79	-9.603E-03
PA-234	131.28	450.	-5.	-0.001	1203.33	-8.520E-03
U-235	143.76	506.	-32.	-0.009	202.30	-1.070E-01
U-235	163.35	342.	-28.	-0.008	189.14	-2.239E-01
U-235	205.31	204.	-12.	-0.003	383.14	-1.121E-01
EU-152	344.30	478.	-22.	-0.006	280.57	-4.973E-02
PA-234	569.26	61.	4.	0.001	661.00	3.436E-02
CS-137	661.66	88.	-19.	-0.005	181.84	-2.149E-02
PA-234	699.10	71.	-9.	-0.003	333.04	-2.004E-01
BI-212	727.17	121.	17.	0.005	185.28	1.485E-01
PA-234	733.00	137.	3.	0.001	1081.46	3.671E-02
EU-152	778.90	94.	8.	0.002	368.80	6.193E-02
BI-212	785.42	110.	-6.	-0.002	535.48	-2.982E-01
PA-234	808.10	50.	-2.	-0.001	1114.30	-5.323E-02
PA-234	831.10	43.	-5.	-0.001	481.00	-1.030E-01
PA-234	898.60	54.	-14.	-0.004	203.54	-4.109E-01
PA-234	926.70	75.	-3.	-0.001	774.60	-3.495E-02
PA-234	946.00	44.	13.	0.004	155.89	7.869E-02
PA-234	949.00	61.	-4.	-0.001	574.95	-6.114E-02
EU-152	964.00	126.	5.	0.001	687.68	3.960E-02
EU-152	1085.80	61.	-11.	-0.003	284.34	-1.424E-01
EU-152	1112.07	162.	-14.	-0.004	269.88	-1.385E-01
CO-60	1173.24	40.	9.	0.002	285.45	1.301E-02
CO-60	1332.50	24.	3.	0.001	655.24	4.827E-03
PA-234	1394.10	21.	1.	0.000	1866.55	4.294E-02
EU-152	1408.08	17.	1.	0.000	1395.23	9.561E-03
BI-212	1620.56	18.	1.	0.000	1254.22	9.826E-02

P - Peakbackground subtraction

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 10:23:44 AM
 AAA Spectrum name: ARS06051.An1

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide		Time of Count	Uncertainty	2 Sigma	MDA
		Activity pCi/g	Counting pCi/g	Total pCi/g	
U-235	#A	-1.0703E-01	2.1652E-01	2.1664E-01	0.360E+00
RA-226		8.1443E-01	3.7639E-01	3.7927E-01	0.519E+00
Ra-228		3.9732E-01	7.1725E-02	7.5962E-02	0.910E-01
Am-241	#A	8.3861E-02	1.5938E-01	1.5947E-01	0.264E+00
PB-210	#A	9.2542E-01	3.0503E+00	3.0516E+00	0.505E+01
U-238	#A	5.1876E-01	1.3933E+00	1.3939E+00	0.231E+01
K-40		1.0494E+01	8.3809E-01	1.0748E+00	0.187E+00
PB-214		4.0624E-01	6.3753E-02	7.2129E-02	0.546E-01
BI-214		3.9364E-01	7.3126E-02	7.6764E-02	0.582E-01
BI-212	#A	1.3902E-01	2.5756E-01	2.5771E-01	0.461E+00
PB-212		3.0233E-01	7.8301E-02	8.1072E-02	0.117E+00
TL-208	#	9.6852E-02	3.6551E-02	3.7045E-02	0.402E-01
PA-234	#A	5.4157E-02	8.4425E-02	8.4514E-02	0.201E+00
CS-137	#A	-2.1490E-02	3.9078E-02	3.9087E-02	0.515E-01
CO-60	#A	8.9171E-03	2.5454E-02	2.5456E-02	0.465E-01
EU-152	#A	3.7348E-01	4.4122E-01	4.4316E-01	0.796E+00
EU-154	#C	1.7122E-01	2.6874E-01	2.6899E-01	0.103E+00


- All peaks for activity calculation had bad shape.
 * - Activity omitted from total
 & - Activity omitted from total and all peaks had bad shape.
 < - MDA value printed.
 A - Activity printed, but activity < MDA.
 B - Activity < MDA and failed test.
 C - Area < Critical level.
 F - Failed fraction or key line test.
 H - Halflife limit exceeded

----- S U M M A R Y -----
 Total Activity (2.6 to 1998.4 keV) 1.290E+01 pCi/g

Analyzed by: _____
 Countroom

Reviewed by: _____
 Supervisor

Laboratory: AAA

 Ortec Gamma		Batch Sample ID	ARS1-B23-01775-05		
		Analytical Batch	ARS1-B23-01775	Analysis Date	9/29/2023 09:24
		Analysis Code	GAM-IG21-SO	SDG	ARS1-23-01973
		Detector	(ARS03) MCB 129	Fraction	002
		Count Time (sec)	3600	Run	1
		Library	ITSI COUNT.Lib		
		Geometry	250mL tuna can poly 1948-64-2		
Isotope	Activity	Units	CSU	MDA	DL
Am-241	2.7848E-002	pCi/g	9.3338E-002	1.5600E-001	7.8000E-002
Bi-212	3.4794E-001	pCi/g	2.8808E-001	4.8500E-001	2.4250E-001
Bi-214	3.3574E-001	pCi/g	8.3176E-002	8.2500E-002	4.1250E-002
Co-60	8.6448E-003	pCi/g	2.8141E-002	5.3400E-002	2.6700E-002
Cs-137	1.2838E-002	pCi/g	3.1529E-002	4.5400E-002	2.2700E-002
Eu-152	4.2052E-002	pCi/g	6.7916E-002	3.2700E-001	1.6350E-001
Eu-154	5.6502E-002	pCi/g	1.1463E-001	7.6100E-002	3.8050E-002
K-40	8.1209E+000	pCi/g	1.0093E+000	4.7000E-001	2.3500E-001
Pa-234	8.3656E-002	pCi/g	1.1949E-001	1.1300E-001	5.6500E-002
Pb-210	-4.9579E-001	pCi/g	1.3231E+000	2.2300E+000	1.1150E+000
Pb-212	3.3666E-001	pCi/g	6.4271E-002	7.0200E-002	3.5100E-002
Pb-214	3.2313E-001	pCi/g	8.0131E-002	8.6200E-002	4.3100E-002
Ra-226	8.6912E-001	pCi/g	7.0580E-001	1.1300E+000	5.6500E-001
Ra-228	3.8090E-001	pCi/g	1.3467E-001	1.3200E-001	6.6000E-002
Tl-208	1.2605E-001	pCi/g	3.6014E-002	3.8500E-002	1.9250E-002
U-235	9.7422E-002	pCi/g	1.5161E-001	2.6000E-001	1.3000E-001
U-238	4.6312E-001	pCi/g	5.6824E-001	8.4700E-001	4.2350E-001

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 10:25:08 AM
 AAA Spectrum name: ARS03247.An1

Sample description

Batch ID: 23-01775-05
 SDG ID: ARS1-23-01973-002 Tech: SDW

Spectrum Filename: C:\User\ARS03247.An1

Acquisition information

Start time: 9/29/2023 9:24:52 AM
 Live time: 3600
 Real time: 3603
 Dead time: 0.09 %
 Detector ID: 17

Detector system

(ARS03) MCB 129

Calibration

Filename: 1948-64-2 250mL tc poly cal 12-15-17.Clb
 250mL tuna can poly 1948-64-2
 12-15-17 EEC

Energy Calibration

Created: 12/15/2017 11:10:20 AM
 Zero offset: 0.253 keV
 Gain: 0.250 keV/channel
 Quadratic: -1.778E-08 keV/channel^2

Efficiency Calibration

Created: 12/15/2017 12:18:46 PM
 Type: Polynomial
 Uncertainty: 1.552 %
 Coefficients: -0.414479 -4.439273 0.364604
 -0.031228 0.000978 -0.000011

Library Files

Main analysis library: ITSI COUNT.Lib
 Library Match Width: 0.500
 Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G800W064
 Start channel: 10 (2.75keV)
 Stop channel: 8000 (1997.02keV)
 Peak rejection level: 1000.000%
 Peak search sensitivity: 1
 Sample Size: 4.2463E+02 +/- 0.000E+00%
 Activity scaling factor: 1.0000E+06/(1.0000E+00* 4.2463E+02) =
 2.3550E+03
 Detection limit method: Reg. Guide 4.16 Method
 Random error: 1.0000000E+00
 Systematic error: 1.0000000E+00
 Fraction Limit: 0.000%
 Background width: 5
 Half lives decay limit: 12.000

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Activity range factor: 2.000
 Min. step backg. energy 0.000
 Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	NO	
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	ITSI.Pbc 9/21/2023 8:26:46 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 0 cutoff: 0.00E+00 %
 Energy Calibration
 Normalized diff: 0.2112

***** S U M M A R Y O F P E A K S I N R A N G E *****									
Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc	
27.65	15.	86.44	0.86	1.598E-02					
30.84	10.	119.03	0.86	1.776E-02					
40.37	29.	41.96	0.87	2.300E-02	39.52	16.000	1.401E-01	EU152	
					40.12	30.000	7.361E-02	EU152	
42.36	14.	90.99	0.87	2.411E-02	42.31	7.300	1.377E-01	EU154	
					43.00	13.100	7.551E-02	EU154	
46.65	84.	18.37	0.87	2.651E-02	46.52	4.000	PBC<MDA	PB210	
48.70	22.	161.35	0.88	2.769E-02	48.70	4.200	PBC<MDA	EU154	
56.26	3.	219.02	0.19	3.237E-02					
59.54	19.	167.55	0.89	3.431E-02	59.54	35.900	PBC<MDA	Am241	
63.49	83.	25.78	0.69	3.648E-02	63.29	3.900	PBC<MDA	U238	
74.90	141.	15.15	0.90	4.144E-02					
77.28	204.	10.63	0.90	4.221E-02					
84.06	21.	78.40	0.91	4.394E-02					
87.27	54.	34.24	0.91	4.452E-02					
89.98	33.	54.15	0.91	4.491E-02					
92.82	100.	20.23	0.92	4.522E-02	92.38	2.570	PBC<MDA	U238	
					92.80	3.000	PBC<MDA	U238	
106.64	5.	135.62	0.00	4.563E-02					
143.70	17.	79.59	0.30	4.203E-02	143.76	10.500	6.773E-02	U235	
158.75	12.	89.30	0.54	3.996E-02					
182.50	19.	67.60	0.99	3.676E-02					
185.75	78.	20.87	1.00	3.635E-02	186.21	3.640	PBC<MDA	RA226	
205.16	16.	79.35	0.60	3.397E-02	205.31	4.700	PBC<MDA	U235	
217.19	7.	108.55	0.45	3.265E-02					
238.63	280.	7.53	1.04	3.050E-02	238.63	43.100	3.395E-01	PB212	
241.81	59.	23.24	1.05	3.021E-02	241.98	7.500	4.096E-01	PB214	

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pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
244.65	20.	185.96	1.05	2.995E-02	244.67	7.616	PBC<MDA	EU152
248.10	9.	95.45	0.45	2.964E-02	248.04	6.600	8.133E-02	EU154
277.36	10.	197.19	1.08	2.728E-02	277.36	6.500	PBC<MDA	TL208
295.35	90.	21.26	0.94	2.603E-02	295.21	18.500	2.797E-01	PB214
305.15	8.	110.00	1.10	2.539E-02				
307.19	15.	64.78	1.10	2.527E-02				
328.65	23.	49.19	1.50	2.403E-02				
338.18	29.	38.47	0.97	2.352E-02	338.40	12.010	PBC<MDA	Ra228
351.91	176.	9.51	1.23	2.283E-02	351.92	35.800	3.298E-01	PB214
463.26	48.	22.00	0.35	1.868E-02				
511.13	201.	11.01	2.54	1.742E-02	510.72	22.500	9.062E-01	TL208
530.70	3.	100.00	0.42	1.696E-02				
546.54	17.	48.25	1.59	1.662E-02				
569.26	9.	118.25	1.32	1.615E-02	569.26	10.400	PBC<MDA	PA234
583.41	107.	12.16	1.26	1.587E-02	583.14	86.000	1.260E-01	TL208
609.51	148.	10.11	1.27	1.540E-02	609.31	44.791	3.357E-01	BI214
661.66	9.	122.78	1.40	1.455E-02	661.66	85.210	PBC<MDA	CS137
677.73	15.	40.38	1.23	1.431E-02				
723.30	12.	101.38	1.45	1.368E-02	723.30	19.700	PBC<MDA	EU154
727.17	9.	142.32	1.45	1.363E-02	727.17	11.800	PBC<MDA	BI212
733.00	12.	121.64	1.46	1.355E-02	733.00	8.500	PBC<MDA	PA234
756.70	11.	107.41	1.48	1.325E-02	756.70	4.100	PBC<MDA	EU154
767.97	27.	33.98	0.87	1.312E-02	768.36	4.799	7.697E-01	BI214
785.42	27.	41.28	1.50	1.292E-02	785.42	2.000	PBC<MDA	BI212
840.74	18.	31.98	0.40	1.232E-02				
860.90	21.	28.74	1.21	1.212E-02	860.47	12.000	2.589E-01	TL208
873.20	3.	405.07	1.57	1.200E-02	873.20	11.300	PBC<MDA	EU154
880.36	1.	156.79	1.58	1.193E-02	880.51	6.500	2.737E-02	PA234
883.24	10.	111.53	1.58	1.190E-02	883.24	12.000	PBC<MDA	PA234
898.60	7.	150.78	1.59	1.176E-02	898.60	4.000	PBC<MDA	PA234
911.59	77.	16.02	1.17	1.164E-02	911.07	29.000	3.809E-01	Ra228
926.70	9.	100.23	1.61	1.150E-02	926.70	11.000	PBC<MDA	PA234
934.00	26.	27.48	4.45	1.144E-02	934.06	3.029	1.316E+00	BI214
963.94	32.	26.29	0.48	1.119E-02	964.00	14.580	3.426E-01	EU152
					964.60	5.452	9.003E-01	Ra228
969.04	8.	149.32	1.65	1.115E-02	968.90	17.460	PBC<MDA	Ra228
1085.67	8.	124.51	1.74	1.026E-02	1085.80	10.290	PBC<MDA	EU152
1112.07	11.	92.99	1.76	1.008E-02	1112.07	13.580	PBC<MDA	EU152
1120.90	53.	16.20	1.94	1.002E-02	1120.29	14.797	5.567E-01	BI214
1173.24	7.	165.98	1.80	9.688E-03	1173.24	99.900	PBC<MDA	CO60
1332.50	3.	280.00	1.92	8.781E-03	1332.50	99.982	PBC<MDA	CO60
1374.98	15.	50.48	1.96	8.551E-03	1377.67	3.919	PBC<MDA	BI214
1408.53	3.	274.42	1.98	8.401E-03	1408.08	21.210	PBC<MDA	EU152
1461.32	414.	5.06	1.86	8.150E-03	1460.75	10.700	8.121E+00	K40
1620.56	4.	171.54	2.13	7.464E-03	1620.56	2.750	PBC<MDA	BI212
1764.98	35.	18.78	2.23	6.914E-03	1764.49	15.357	4.816E-01	BI214
1766.27	3.	347.10	2.23	6.910E-03	1764.49	15.357	PBC<MDA	BI214

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***** U N I D E N T I F I E D P E A K S U M M A R Y *****

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma	FWHM %	Suspected Nuclide
109.71	27.65	74.	15.	9.252E+02	172.88	0.857	SB-124
122.48	30.84	67.	10.	5.660E+02	238.06	0.860	J-131
168.61	42.21	71.	14.	5.690E+02	182.24	0.870	CE-141
224.26	56.26	33.	3.	9.885E+01	438.04	0.195	HF-181
298.89	74.89	159.	141.	3.411E+03	30.30	0.899	TH-234 D
308.42	77.27	133.	204.	4.832E+03	21.26	0.901	PB-212 D
335.75	84.09	124.	22.	4.991E+02	149.83	0.907	HG-203 c
348.61	87.30	149.	54.	1.216E+03	69.28	0.910	PB-212 D
359.49	90.02	136.	33.	7.251E+02	107.33	0.913	AC-228 sD
426.00	106.64	26.	5.	1.008E+02	271.24	0.000	- sc
634.41	158.75	65.	15.	3.698E+02	163.05	0.973	MO-99 sc
729.52	182.43	75.	19.	5.234E+02	135.02	0.994	U-235 sc
868.71	217.19	34.	7.	2.267E+02	217.09	0.447	- sc
992.44	248.10	50.	14.	4.636E+02	155.59	1.051	EU-154 sc
1220.98	305.21	36.	8.	3.200E+02	219.99	1.100	BA-140 sc
1229.16	307.25	39.	15.	5.891E+02	129.57	1.102	- sD
1315.08	328.65	42.	23.	9.573E+02	98.38	1.499	LA-140 s
1854.21	463.26	24.	48.	2.580E+03	44.00	0.350	SB-125 s
2124.33	530.70	4.	3.	1.768E+02	200.00	0.416	ND-147 sc
2187.77	546.54	17.	17.	1.017E+03	96.50	1.593	J-135 s
2713.26	677.73	8.	15.	1.021E+03	80.76	1.232	AG-110M M
3366.27	840.74	4.	18.	1.429E+03	63.96	0.396	- s
3525.00	880.36	2.	1.	1.006E+02	313.58	0.000	- sc
7077.37	1766.49	40.	4.	6.042E+02	438.97	2.233	RH-106 sc

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 L - Peak written from unknown list.
 C - Area < Critical level.
 M - Peak is close to a library peak.

 This section based on library: ITSI COUNT.Lib

***** I D E N T I F I E D P E A K S U M M A R Y *****

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma	FWHM %
EU-152	157.23	39.52	762.	-23.	-0.006	346.71	0.868
EU-152	159.64	40.12	715.	-23.	-0.006	335.85	0.868s
EU-154	168.41	42.31	692.	-23.	-0.006	329.89	0.870s
EU-154	171.17	43.00	670.	-23.	-0.006	324.27	0.871s
EU-152	180.78	45.40	636.	-23.	-0.006	315.31	0.873s

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Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
PB-210	185.26	46.52	782.	-30.	-0.008	266.68	0.874s
EU-154	193.99	48.70	592.	22.	0.006	322.70	0.876s
Am-241	237.40	59.54	519.	19.	0.005	335.11	0.886s
U-238	253.21	63.49	196.	37.	0.010	122.46	0.688
U-238	368.90	92.38	1299.	30.	0.008	140.99	0.915D
U-238	370.59	92.80	1182.	36.	0.010	122.09	0.915D
PA-234	393.17	98.44	229.	-15.	-0.004	660.73	0.920s
PA-234	398.22	99.70	296.	-11.	-0.003	912.13	0.921s
PA-234	443.47	111.00	327.	-13.	-0.004	757.09	0.931s
EU-152	486.63	121.78	210.	0.	0.000	2000.00	0.941s
EU-154	491.92	123.10	258.	-7.	-0.002	644.39	0.942s
PA-234	524.68	131.28	286.	-28.	-0.008	187.51	0.949s
U-235	574.65	143.76	178.	15.	0.004	267.38	0.960s
U-235	653.10	163.35	410.	-26.	-0.007	227.59	0.977
RA-226	744.65	186.21	305.	65.	0.018	80.96	0.997
U-235	820.55	205.16	66.	16.	0.004	158.71	0.601s
PA-234	907.48	226.87	149.	-14.	-0.004	383.89	1.032s
PB-212	954.57	238.63	113.	250.	0.070	17.52	1.043D
PB-214	967.99	241.98	82.	44.	0.012	66.57	1.046D
EU-152	978.76	244.67	694.	20.	0.006	371.92	1.048s
EU-154	992.26	248.04	731.	-11.	-0.003	716.72	1.051s
TL-208	1109.68	277.36	137.	10.	0.003	394.37	1.076
PB-214	1181.18	295.21	78.	82.	0.023	38.14	1.092D
PB-212	1200.71	300.09	328.	-11.	-0.003	226.58	1.096
Ra-228	1353.24	338.18	48.	26.	0.007	88.40	0.972
EU-152	1377.77	344.30	101.	-18.	-0.005	179.23	1.134s
PB-214	1408.24	351.91	64.	152.	0.042	23.24	1.232
TL-208	2044.31	510.72	84.	159.	0.044	28.58	2.524
PA-234	2278.79	569.26	34.	9.	0.002	236.50	1.323s
TL-208	2335.46	583.41	34.	97.	0.027	27.87	1.255
BI-214	2440.00	609.51	40.	131.	0.036	24.04	1.267s
CS-137	2648.91	661.66	39.	9.	0.002	245.55	1.399s
EU-154	2895.82	723.30	65.	12.	0.003	202.77	1.449s
BI-212	2911.32	727.17	79.	9.	0.003	284.63	1.452s
PA-234	2934.68	733.00	92.	12.	0.003	243.27	1.457s
EU-154	3029.62	756.70	38.	11.	0.003	214.83	1.476s
TL-208	3056.06	763.30	86.	-2.	0.000	1547.85	1.482
BI-214	3074.75	767.97	18.	27.	0.008	67.97	0.865s
EU-152	3118.55	778.90	29.	-3.	-0.001	685.42	1.494s
BI-212	3144.67	785.42	31.	27.	0.008	82.55	1.499s
PA-234	3235.53	808.10	42.	-8.	-0.002	307.52	1.518s
PA-234	3327.67	831.10	51.	-13.	-0.004	198.66	1.536s
TL-208	3445.33	860.47	45.	6.	0.002	388.55	1.559s
EU-152	3473.05	867.39	80.	-16.	-0.004	167.72	1.565
EU-154	3496.33	873.20	87.	3.	0.001	810.15	1.569s
PA-234	3525.61	880.51	63.	-7.	-0.002	338.43	1.575s
PA-234	3536.55	883.24	57.	10.	0.003	223.07	1.578s
PA-234	3598.08	898.60	36.	7.	0.002	301.56	1.590s

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Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
Ra-228	3650.11	911.59	23.	73.	0.020	34.79	1.174s
PA-234	3710.66	926.70	26.	9.	0.003	200.45	1.612s
BI-214	3739.91	934.00	7.	26.	0.007	54.97	4.448s
PA-234	3787.98	946.00	41.	-4.	-0.001	424.46	1.627s
PA-234	3800.00	949.00	48.	-2.	-0.001	1250.90	1.629s
EU-152	3860.10	964.00	119.	-13.	-0.004	239.19	1.641
Ra-228	3862.50	964.60	13.	23.	0.006	62.20	1.642D
Ra-228	3879.73	968.90	67.	8.	0.002	298.64	1.645s
EU-154	4023.56	1004.80	51.	-17.	-0.005	160.15	1.673s
EU-152	4348.09	1085.80	31.	8.	0.002	249.01	1.736s
EU-152	4453.35	1112.07	31.	11.	0.003	185.98	1.756
BI-214	4488.71	1120.90	11.	47.	0.013	38.21	1.938
CO-60	4698.44	1173.24	32.	7.	0.002	331.95	1.802s
BI-214	4958.38	1238.11	68.	-14.	-0.004	221.27	1.852
EU-154	5105.40	1274.80	36.	-4.	-0.001	570.09	1.879
CO-60	5336.62	1332.50	14.	3.	0.001	560.01	1.922s
BI-214	5517.62	1377.67	12.	15.	0.004	100.96	1.955s
PA-234	5583.46	1394.10	23.	-7.	-0.002	221.96	1.967s
EU-152	5639.49	1408.08	15.	3.	0.001	548.84	1.978
K-40	5852.84	1461.32	19.	401.	0.111	10.64	1.857
BI-212	6491.04	1620.56	9.	4.	0.001	343.07	2.130s

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Average Code Activity pCi/g	Energy keV	Peak Activity pCi/g	Code MDA Value pCi/g	COMMENTS
U-235	9.7422E-02				1.39E+09
		143.76	6.171E-02	?(2.597E-01	1.34E+02 1.05E+01 G
		205.31	1.772E-01	(4.493E-01	7.94E+01 4.70E+00 G
		163.35	2.443E-01	+ 9.281E-01	1.14E+02 4.70E+00 G
RA-226	8.6912E-01				5.84E+05
		186.21	8.691E-01	&(P 1.126E+00	4.05E+01 3.64E+00 G K
Ra-228	3.8090E-01				2.10E+03
		911.07	3.809E-01	(P 1.319E-01	1.74E+01 2.90E+01 G
		968.90	7.315E-02	- P 3.712E-01	1.49E+02 1.75E+01 G
		338.40	1.647E-01	- P 2.185E-01	4.42E+01 1.20E+01 G
		964.60	6.718E-01	+ P 5.629E-01	3.11E+01 5.45E+00 G
Am-241	T 2.7848E-02				1.58E+05
		59.54	2.785E-02	?(1.562E-01	1.68E+02 3.59E+01 G K

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Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
PB-210	-4.9579E-01						7.45E+03
		46.52	4.958E-01	?(P	2.230E+00	1.33E+02	4.00E+00 G
U-238	4.6312E-01						1.63E+12
		63.29	4.631E-01	(P	8.465E-01	6.12E+01	3.90E+00 G
		92.80	4.631E-01	} P	2.123E+00	6.10E+01	3.00E+00 G
		92.38	4.631E-01	} P	2.598E+00	7.05E+01	2.57E+00 G
K-40	8.1209E+00						4.68E+11
		1460.75	8.121E+00	(P	4.702E-01	5.32E+00	1.07E+01 G
PB-214	3.2313E-01						5.84E+05
		351.92	3.298E-01	(P	8.619E-02	1.16E+01	3.58E+01 G
		295.21	3.026E-01	(P	1.613E-01	1.91E+01	1.85E+01 G
		241.98	3.420E-01	(P	3.511E-01	3.33E+01	7.50E+00 G
BI-214	3.3574E-01						5.84E+05
		609.31	3.357E-01	*(P	8.248E-02	1.20E+01	4.48E+01 G
		1764.49	4.989E-03	% P	3.414E-01	1.85E+03	1.54E+01 G
		1120.29	5.567E-01	+ P	2.188E-01	1.91E+01	1.48E+01 G
		1238.11	4.673E-01	-	1.339E+00	1.11E+02	5.86E+00 G
		768.36	7.697E-01	+ P	6.253E-01	3.40E+01	4.80E+00 G
		1377.67	8.062E-01	& P	9.847E-01	5.05E+01	3.92E+00 G
		934.06	1.316E+00	+	7.763E-01	2.75E+01	3.03E+00 G
BI-212	3.4794E-01						2.10E+03
		727.17	1.014E-01	?(P	4.854E-01	1.42E+02	1.18E+01 G
		1620.56	3.136E-01	?(P	1.461E+00	1.72E+02	2.75E+00 G
		785.42	1.850E+00	&(P	1.960E+00	4.13E+01	2.00E+00 G
PB-212	3.3666E-01						2.10E+03
		238.63	3.367E-01	(P	7.017E-02	8.76E+00	4.31E+01 G
		300.09	2.339E-01	- P	1.832E+00	1.13E+02	3.27E+00 G
TL-208	1.2605E-01						2.10E+03
		583.14	1.260E-01	(P	3.850E-02	1.39E+01	8.60E+01 G
		510.72	7.186E-01	+	2.043E-01	1.43E+01	2.25E+01 G
		860.47	7.537E-02	-	4.121E-01	1.94E+02	1.20E+01 G
		277.36	9.632E-02	- P	5.715E-01	1.97E+02	6.50E+00 G
		763.30	1.342E-01	-	3.619E+00	7.74E+02	1.70E+00 G
PA-234	8.3656E-02						1.65E+12
		98.44	2.301E-02	&(P	1.131E-01	3.30E+02	2.51E+01 G
		946.00	3.431E-02	+	2.549E-01	2.12E+02	2.00E+01 G
		131.28	5.657E-02	+	1.651E-01	9.38E+01	2.00E+01 G
		94.67	6.787E-04	% P	4.050E-01	1.81E+04	1.55E+01 G
		883.24	1.238E-01	?(	4.699E-01	1.12E+02	1.20E+01 G

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 10:25:08 AM
 AAA Spectrum name: ARS03247.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		926.70	1.313E-01	(	3.673E-01	1.00E+02	1.10E+01 G
		569.26	9.474E-02	(P	3.146E-01	1.18E+02	1.04E+01 G
		111.00-5.986E-02	+ P	3.957E-01	3.79E+02	8.55E+00	G
		733.00	1.769E-01	*(	7.295E-01	1.22E+02	8.50E+00 G
		949.00-4.200E-02	+ P	7.006E-01	6.25E+02	7.80E+00	G
		880.51-1.551E-01	+	9.040E-01	1.69E+02	6.50E+00	G
		226.87-1.202E-01	+ P	5.122E-01	1.92E+02	6.50E+00	G
		831.10-3.356E-01	&	9.166E-01	9.93E+01	5.60E+00	G
		808.10-2.165E-01	+	9.336E-01	1.54E+02	4.90E+00	G
		99.70-8.945E-02	+ P	6.832E-01	4.56E+02	4.70E+00	G
		699.10-2.745E-02	%	9.879E-01	1.22E+03	4.60E+00	G
		898.60	2.744E-01	?(P	1.149E+00	1.51E+02	4.00E+00 G
		1394.10-3.897E-01	+ P	1.349E+00	1.11E+02	3.90E+00	G
CS-137	1.2838E-02					1.10E+04	
		661.66	1.284E-02	?(	4.538E-02	1.23E+02	8.52E+01 G
CO-60	8.6448E-03					1.93E+03	
		1173.24	1.206E-02	?(	5.341E-02	1.66E+02	9.99E+01 K
		1332.50	5.236E-03	?(	4.107E-02	2.80E+02	1.00E+02 K
EU-152	4.2052E-02					4.64E+03	
		40.12-5.830E-02	?(	3.270E-01	1.68E+02	3.00E+01	G
		121.78	0.000E+00	&	9.511E-02	1.00E+03	2.92E+01 G
		344.30-5.191E-02	+	1.400E-01	8.96E+01	2.70E+01	G
		1408.08	2.778E-02	?(	2.071E-01	2.74E+02	2.12E+01 G
		39.52-1.109E-01	+	6.418E-01	1.73E+02	1.60E+01	G
		964.00-1.440E-01	+	5.816E-01	1.20E+02	1.46E+01	G
		1112.07	1.472E-01	(	3.678E-01	9.30E+01	1.36E+01 G
		778.90-2.933E-02	&	2.904E-01	3.43E+02	1.30E+01	G
		1085.80	1.406E-01	?(	4.770E-01	1.25E+02	1.03E+01 G
		45.40-1.731E-01	+	9.119E-01	1.58E+02	9.00E+00	G
		244.67	1.564E-01	?(	9.726E-01	1.86E+02	7.62E+00 G
		867.39-5.547E-01	+	1.557E+00	8.39E+01	4.18E+00	G
EU-154	5.6502E-02					3.10E+03	
		123.10-6.968E-03	?(	7.614E-02	3.22E+02	4.05E+01	G
		1274.80-2.191E-02	&	1.680E-01	2.85E+02	3.55E+01	G
		723.30	7.695E-02	(	2.640E-01	1.01E+02	1.97E+01 G
		1004.80-1.573E-01	+	3.330E-01	8.01E+01	1.76E+01	G
		43.00-1.251E-01	&	6.777E-01	1.62E+02	1.31E+01	G
		873.20	4.294E-02	&(	6.032E-01	4.05E+02	1.13E+01 G
		996.30-1.815E-02	%	5.096E-01	1.01E+03	1.07E+01	G
		42.31-2.279E-01	+	1.256E+00	1.65E+02	7.30E+00	G
		248.04-9.675E-02	+	1.163E+00	3.58E+02	6.60E+00	G
		591.70-2.445E-02	%	8.047E-01	1.11E+03	4.60E+00	G
		48.70	3.270E-01	?(	1.764E+00	1.61E+02	4.20E+00 G
		756.70	3.449E-01	?(	1.028E+00	1.07E+02	4.10E+00 G

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 10:25:08 AM
 AAA Spectrum name: ARS03247.An1

- (- This peak used in the nuclide activity average.
- * - Peak is too wide, but only one peak in library.
- ! - Peak is part of a multiplet and this area went negative during deconvolution.
- ? - Peak is too narrow.
- @ - Peak is too wide at FW25M, but ok at FWHM.
- % - Peak fails sensitivity test.
- \$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
- + - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
- = - Peak outside analysis energy range.
- & - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
- P - Peakbackground subtraction
- } - Peak is too close to another for the activity to be found directly.

Nuclide Codes:

T - Thermal Neutron Activation
 F - Fast Neutron Activation
 I - Fission Product
 N - Naturally Occurring Isotope
 P - Photon Reaction
 C - Charged Particle Reaction
 M - No MDA Calculation
 R - Coincidence Corrected
 H - Halflife limit exceeded

Peak Codes:

G - Gamma Ray
 X - X-Ray
 P - Positron Decay
 S - Single-Escape
 D - Double-Escape
 K - Key Line
 A - Not in Average
 C - Coincidence Peak

***** D I S C A R D E D I S O T O P E P E A K S *****

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
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EU-154	42.31	692.	-23.	-0.006	329.89	-2.279E-01
EU-154	43.00	670.	-23.	-0.006	324.27	-1.251E-01
PB-210	46.52	782.	-30.	-0.008	266.68	-4.958E-01 P
EU-154	48.70	592.	22.	0.006	322.70	3.270E-01
Am-241	59.54	519.	19.	0.005	335.11	2.785E-02
PA-234	98.44	229.	-15.	-0.004	660.73	-2.301E-02 P
PA-234	99.70	296.	-11.	-0.003	912.13	-8.945E-02 P
PA-234	111.00	327.	-13.	-0.004	757.09	-5.986E-02 P
EU-154	123.10	258.	-7.	-0.002	644.39	-6.968E-03
PA-234	131.28	286.	-28.	-0.008	187.51	-5.657E-02
PA-234	226.87	149.	-14.	-0.004	383.89	-1.202E-01 P
EU-154	248.04	731.	-11.	-0.003	716.72	-9.675E-02
PA-234	569.26	34.	9.	0.002	236.50	9.474E-02 P
CS-137	661.66	39.	9.	0.002	245.55	1.284E-02
EU-154	723.30	65.	12.	0.003	202.77	7.695E-02
BI-212	727.17	79.	9.	0.003	284.63	1.014E-01 P
PA-234	733.00	92.	12.	0.003	243.27	1.769E-01
EU-154	756.70	38.	11.	0.003	214.83	3.449E-01

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 10:25:08 AM
 AAA Spectrum name: ARS03247.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
BI-212	785.42	31.	27.	0.008	82.55	1.850E+00	P
PA-234	808.10	42.	-8.	-0.002	307.52	-2.165E-01	
PA-234	831.10	51.	-13.	-0.004	198.66	-3.356E-01	
EU-154	873.20	87.	3.	0.001	810.15	4.294E-02	
PA-234	880.51	63.	-7.	-0.002	338.43	-1.551E-01	
PA-234	883.24	57.	10.	0.003	223.07	1.238E-01	
PA-234	898.60	36.	7.	0.002	301.56	2.744E-01	P
PA-234	926.70	26.	9.	0.003	200.45	1.313E-01	
PA-234	946.00	41.	-4.	-0.001	424.46	-3.431E-02	
PA-234	949.00	48.	-2.	-0.001	1250.90	-4.200E-02	P
EU-154	1004.80	51.	-17.	-0.005	160.15	-1.573E-01	
CO-60	1173.24	32.	7.	0.002	331.95	1.206E-02	
EU-154	1274.80	36.	-4.	-0.001	570.09	-2.191E-02	
CO-60	1332.50	14.	3.	0.001	560.01	5.236E-03	
PA-234	1394.10	23.	-7.	-0.002	221.96	-3.897E-01	P
BI-212	1620.56	9.	4.	0.001	343.07	3.136E-01	P

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count	Uncertainty	2 Sigma	MDA
	Activity	Counting	Total	
	pCi/g	pCi/g	pCi/g	pCi/g
U-235 A	9.7422E-02	1.5146E-01	1.5161E-01	0.260E+00
RA-226 A	8.6912E-01	7.0364E-01	7.0580E-01	0.113E+01
Ra-228	3.8090E-01	1.3250E-01	1.3467E-01	0.132E+00
Am-241 #A	2.7848E-02	9.3321E-02	9.3338E-02	0.156E+00
PB-210 #A	-4.9579E-01	1.3222E+00	1.3231E+00	0.223E+01
U-238 A	4.6312E-01	5.6712E-01	5.6824E-01	0.847E+00
K-40	8.1209E+00	8.6432E-01	1.0093E+00	0.470E+00
PB-214	3.2313E-01	7.5105E-02	8.0131E-02	0.862E-01
BI-214	3.3574E-01	8.0705E-02	8.3176E-02	0.825E-01
BI-212 #A	3.4794E-01	2.8723E-01	2.8808E-01	0.485E+00
PB-212 #	3.3666E-01	5.8979E-02	6.4271E-02	0.702E-01
TL-208	1.2605E-01	3.5126E-02	3.6014E-02	0.385E-01
PA-234 #A	8.3656E-02	1.1933E-01	1.1949E-01	0.113E+00
CS-137 #A	1.2838E-02	3.1525E-02	3.1529E-02	0.454E-01
CO-60 #A	8.6448E-03	2.8139E-02	2.8141E-02	0.534E-01
EU-152 A	4.2052E-02	6.7752E-02	6.7916E-02	0.327E+00
EU-154 #A	5.6502E-02	1.1457E-01	1.1463E-01	0.761E-01

- All peaks for activity calculation had bad shape.

* - Activity omitted from total

& - Activity omitted from total and all peaks had bad shape.

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 10:25:08 AM
AAA Spectrum name: ARS03247.An1


< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

----- S U M M A R Y -----
Total Activity (2.8 to 1997.0 keV) 1.096E+01 pCi/g

Analyzed by: _____
Countroom

Reviewed by: _____
Supervisor

Laboratory: AAA

 Ortec Gamma		Batch Sample ID	ARS1-B23-01775-06		
		Analytical Batch	ARS1-B23-01775	Analysis Date	9/29/2023 10:28
		Analysis Code	GAM-IG21-SO	SDG	ARS1-23-01973
		Detector	ARS06 MCB 133	Fraction	003
		Count Time (sec)	3600	Run	1
		Library	ITSI COUNT.Lib		
		Geometry	2275-19-5 250mL tc poly		
Isotope	Activity	Units	CSU	MDA	DL
Am-241	-9.2733E-002	pCi/g	3.3107E-001	5.4800E-001	2.7400E-001
Bi-212	3.0915E-001	pCi/g	2.9876E-001	4.9200E-001	2.4600E-001
Bi-214	3.0123E-001	pCi/g	7.5406E-002	7.5500E-002	3.7750E-002
Co-60	0.0000E+000	pCi/g	2.7197E-002	5.3200E-002	2.6600E-002
Cs-137	9.0870E-003	pCi/g	3.3748E-002	4.5600E-002	2.2800E-002
Eu-152	-1.1228E-001	pCi/g	3.0247E-001	1.1200E+000	5.6000E-001
Eu-154	3.8903E-002	pCi/g	8.0417E-002	7.4700E-002	3.7350E-002
K-40	9.5351E+000	pCi/g	1.0310E+000	2.2400E-001	1.1200E-001
Pa-234	4.5958E-002	pCi/g	1.3112E-001	2.3700E-001	1.1850E-001
Pb-210	-1.1330E+000	pCi/g	4.1547E+000	6.8700E+000	3.4350E+000
Pb-212	3.9992E-001	pCi/g	5.7292E-002	4.6700E-002	2.3350E-002
Pb-214	3.4404E-001	pCi/g	7.2910E-002	8.1400E-002	4.0700E-002
Ra-226	8.4033E-001	pCi/g	4.8591E-001	6.3500E-001	3.1750E-001
Ra-228	3.8691E-001	pCi/g	9.0331E-002	9.0600E-002	4.5300E-002
Tl-208	1.2875E-001	pCi/g	3.1432E-002	2.8600E-002	1.4300E-002
U-235	8.9099E-002	pCi/g	1.7615E-001	3.6600E-001	1.8300E-001
U-238	-8.1436E-001	pCi/g	2.9807E+000	4.9300E+000	2.4650E+000

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 11:28:33 AM
 AAA Spectrum name: ARS06052.An1

Sample description

Batch ID: 23-01775-06
 SDG ID: ARS1-23-01973-003 Tech: SDW

Spectrum Filename: C:\User\ARS06052.An1

Acquisition information

Start time: 9/29/2023 10:28:23 AM
 Live time: 3600
 Real time: 3603
 Dead time: 0.10 %
 Detector ID: 21

Detector system

ARS06 MCB 133

Calibration

Filename: 2275-19-5 250mL tc poly cal 12-8-21.Clb
 2275-19-5 250mL tc poly
 12-8-21 EEC

Energy Calibration

Created: 12/8/2021 10:48:48 AM
 Zero offset: 0.100 keV
 Gain: 0.250 keV/channel
 Quadratic: -3.095E-08 keV/channel^2

Efficiency Calibration

Created: 12/8/2021 11:58:07 AM
 Type: Polynomial
 Uncertainty: 1.254 %
 Coefficients: -0.502841 -4.041766 0.314910
 -0.026798 0.000803 -0.000009

Library Files

Main analysis library: ITSI COUNT.Lib
 Library Match Width: 0.500
 Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G800W064
 Start channel: 10 (2.60keV)
 Stop channel: 8000 (1998.39keV)
 Peak rejection level: 1000.000%
 Peak search sensitivity: 1
 Sample Size: 3.9554E+02 +/- 0.000E+00%
 Activity scaling factor: 1.0000E+06/(1.0000E+00* 3.9554E+02) =
 2.5282E+03
 Detection limit method: Reg. Guide 4.16 Method
 Random error: 1.0000000E+00
 Systematic error: 1.0000000E+00
 Fraction Limit: 0.000%
 Background width: 5
 Half lives decay limit: 12.000

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 11:28:33 AM
 AAA Spectrum name: ARS06052.An1

Activity range factor: 2.000
 Min. step backg. energy 0.000
 Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	NO	
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	ITSI.Pbc 9/21/2023 8:04:04 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 0 cutoff: 0.00E+00 %
 Energy Calibration
 Normalized diff: 0.1452

***** S U M M A R Y O F P E A K S I N R A N G E *****									
Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc	
11.92	762.	4.97	0.95	1.349E-03					
15.28	234.	18.47	0.95	4.032E-03					
22.10	28.	148.87	0.96	9.362E-03					
27.65	25.	183.82	0.97	1.378E-02					
31.33	16.	232.97	0.97	1.672E-02					
39.35	24.	111.06	0.98	2.312E-02	39.52	16.000	1.224E-01	EU152	
					40.12	30.000	6.399E-02	EU152	
53.11	87.	37.58	1.00	3.447E-02					
55.08	104.	34.46	1.00	3.614E-02					
57.62	170.	21.19	1.00	3.819E-02					
59.99	146.	24.17	1.00	4.003E-02	59.54	35.900	1.940E-01	Am241	
68.55	37.	64.11	0.92	4.574E-02					
74.97	64.	43.89	1.02	4.900E-02					
77.19	248.	12.57	1.02	4.993E-02					
86.90	47.	49.72	0.94	5.293E-02					
99.70	24.	142.61	1.05	5.465E-02	99.70	4.700	PBC<MDA	PA234	
103.79	56.	41.62	1.29	5.480E-02					
121.81	20.	85.13	1.63	5.399E-02	121.78	29.240	PBC<MDA	EU152	
129.35	9.	137.70	0.25	5.319E-02					
143.76	10.	305.15	1.10	5.129E-02	143.76	10.500	PBC<MDA	U235	
148.86	7.	117.71	0.11	5.055E-02					
163.35	25.	98.79	1.12	4.839E-02	163.35	4.700	PBC<MDA	U235	
168.58	17.	86.60	0.55	4.761E-02					
186.09	73.	28.77	1.46	4.507E-02	186.21	3.640	8.403E-01	RA226	
192.91	9.	156.40	1.16	4.412E-02					
193.54	9.	168.44	1.16	4.403E-02					
227.50	17.	62.69	1.20	3.975E-02	226.87	6.500	1.254E-01	PA234	

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 11:28:33 AM
 AAA Spectrum name: ARS06052.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
230.46	26.	51.36	1.20	3.942E-02				
238.50	352.	6.26	1.21	3.855E-02	238.63	43.100	4.023E-01	PB212
241.78	71.	22.12	1.21	3.820E-02	241.98	7.500	4.709E-01	PB214
247.07	22.	52.09	1.22	3.765E-02	248.04	6.600	1.713E-01	EU154
277.36	5.	371.59	1.25	3.480E-02	277.36	6.500	PBC<MDA	TL208
295.15	125.	15.49	1.32	3.335E-02	295.21	18.500	3.849E-01	PB214
299.94	21.	119.92	1.28	3.297E-02	300.09	3.270	PBC<MDA	PB212
323.22	7.	92.80	0.36	3.132E-02				
337.89	73.	21.27	1.01	3.037E-02	338.40	12.010	3.803E-01	Ra228
344.30	6.	289.54	1.33	2.998E-02	344.30	27.000	PBC<MDA	EU152
351.73	174.	12.62	1.40	2.954E-02	351.92	35.800	3.130E-01	PB214
510.92	193.	12.80	2.30	2.284E-02	510.72	22.500	7.140E-01	TL208
583.33	122.	11.80	1.39	2.086E-02	583.14	86.000	1.287E-01	TL208
591.70	1.	815.54	1.59	2.065E-02	591.70	4.600	PBC<MDA	EU154
609.55	152.	11.55	1.63	2.024E-02	609.31	44.791	3.182E-01	BI214
661.66	8.	185.68	1.66	1.912E-02	661.66	85.210	PBC<MDA	CS137
693.50	7.	68.51	0.75	1.850E-02				
725.41	4.	105.82	0.35	1.793E-02				
727.17	19.	88.08	1.72	1.790E-02	727.17	11.800	PBC<MDA	BI212
733.00	7.	237.46	1.73	1.780E-02	733.00	8.500	PBC<MDA	PA234
756.70	16.	103.30	1.75	1.740E-02	756.70	4.100	PBC<MDA	EU154
763.30	7.	266.00	1.76	1.730E-02	763.30	1.700	PBC<MDA	TL208
768.36	3.	670.46	1.76	1.722E-02	768.36	4.799	PBC<MDA	BI214
783.89	16.	86.51	1.78	1.695E-02	785.42	2.000	PBC<MDA	BI212
808.10	6.	210.30	1.80	1.661E-02	808.10	4.900	PBC<MDA	PA234
861.46	11.	44.50	0.60	1.586E-02	860.47	12.000	1.067E-01	TL208
889.55	6.	56.24	0.44	1.549E-02				
911.24	98.	13.02	1.43	1.521E-02	911.07	29.000	4.194E-01	Ra228
946.00	5.	202.98	1.93	1.479E-02	946.00	20.000	PBC<MDA	PA234
968.68	69.	20.24	1.93	1.453E-02	968.90	17.460	5.163E-01	Ra228
996.30	8.	117.33	1.98	1.422E-02	996.30	10.700	PBC<MDA	EU154
1004.80	3.	406.17	1.99	1.413E-02	1004.80	17.600	PBC<MDA	EU154
1085.41	5.	188.69	2.06	1.330E-02	1085.80	10.290	PBC<MDA	EU152
1120.29	22.	80.71	2.09	1.297E-02	1120.29	14.797	PBC<MDA	BI214
1123.38	5.	147.55	0.00	1.295E-02				
1377.60	8.	135.15	2.30	1.089E-02	1377.67	3.919	PBC<MDA	BI214
1408.08	5.	190.89	2.33	1.068E-02	1408.08	21.210	PBC<MDA	EU152
1460.99	555.	4.35	2.25	1.033E-02	1460.75	10.700	9.535E+00	K40
1620.56	7.	75.37	2.49	9.350E-03	1620.56	2.750	PBC<MDA	BI212
1670.78	6.	40.82	0.87	9.069E-03				
1729.50	15.	25.82	0.31	8.755E-03				
1764.91	37.	16.44	1.00	8.572E-03	1764.49	15.357	4.519E-01	BI214

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***** U N I D E N T I F I E D P E A K S U M M A R Y *****

Peak Centroid Channel	Background Energy	Net Area Counts	Efficiency Counts	Uncert * Area	FWHM 2 Sigma %	Suspected keV	Nuclide
47.27	12.06	336.	762.	5.649E+05	9.94	0.947	- sD
60.72	15.42	819.	234.	5.811E+04	36.94	0.951	- sD
88.00	22.10	874.	28.	3.024E+03	297.74	0.959	- sc
110.17	27.65	1038.	25.	1.809E+03	367.65	0.965	- sc
124.90	31.33	715.	16.	9.765E+02	465.93	0.970	- sc
156.92	39.35	429.	75.	3.240E+03	81.55	0.979	- sD
212.63	53.11	552.	88.	2.541E+03	78.83	0.996	- sD
220.53	55.09	579.	102.	2.826E+03	69.53	0.998	- sD
230.67	57.62	597.	158.	4.146E+03	46.44	1.001	- sD
273.78	68.55	292.	37.	8.089E+02	128.21	0.918	- sc
299.44	74.93	367.	64.	1.313E+03	87.79	1.021	- sD
308.33	77.15	360.	248.	4.957E+03	25.13	1.024	- sD
347.18	86.90	240.	47.	8.917E+02	99.44	0.943	- s
414.71	103.79	189.	56.	1.026E+03	83.24	1.292	- s
516.96	129.35	81.	9.	1.655E+02	275.40	0.248	- sc
595.00	148.86	38.	7.	1.306E+02	235.43	0.113	- sc
673.89	168.58	86.	17.	3.486E+02	173.21	0.549	- sc
771.22	192.91	96.	9.	2.058E+02	312.81	1.157	- sc
773.73	193.54	112.	9.	2.061E+02	336.88	1.158	- sc
909.30	227.59	47.	16.	4.127E+02	127.61	1.196	- sD
921.14	230.55	77.	27.	6.850E+02	99.41	1.200	- sD
987.30	247.06	67.	21.	5.697E+02	116.15	1.218	- sD
1292.51	323.22	21.	7.	2.299E+02	185.59	0.359	- sc
2774.19	693.62	8.	7.	3.783E+02	137.02	0.748	- s
2901.88	725.41	38.	3.	1.936E+02	511.60	1.722	- sc
3558.89	889.55	2.	6.	3.616E+02	112.49	0.437	- s
4495.00	1123.38	55.	5.	3.989E+02	414.95	2.092	- sc
6687.33	1670.78	0.	6.	6.616E+02	81.65	0.874	- s
6922.57	1729.50	0.	15.	1.713E+03	51.64	0.312	- s

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 L - Peak written from unknown list.
 C - Area < Critical level.

 This section based on library: ITSI COUNT.Lib

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***** I D E N T I F I E D P E A K S U M M A R Y *****

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma	FWHM % keV
EU-152	157.66	39.52	8099.	-66.	-0.018	385.54	0.980
EU-152	160.06	40.12	8038.	-66.	-0.018	383.88	0.980s
EU-154	168.82	42.31	7972.	-66.	-0.018	381.27	0.983s
EU-154	171.58	43.00	7906.	-66.	-0.018	379.35	0.984s
EU-152	181.18	45.40	7837.	-67.	-0.019	376.67	0.986s
PB-210	185.66	46.52	7858.	-69.	-0.019	366.58	0.988s
EU-154	194.38	48.70	7789.	-69.	-0.019	364.12	0.990s
Am-241	237.73	59.54	7682.	-70.	-0.019	356.96	1.003
U-238	252.73	63.29	8392.	-71.	-0.020	365.93	1.008s
U-238	369.09	92.38	1318.	-36.	-0.010	286.10	1.041s
U-238	370.77	92.80	1282.	-36.	-0.010	282.05	1.042s
PA-234	378.24	94.67	1278.	-32.	-0.009	322.79	1.044s
PA-234	398.36	99.70	559.	24.	0.007	285.21	1.050
EU-152	486.81	121.81	124.	20.	0.006	170.26	1.626s
EU-154	491.96	123.10	318.	-10.	-0.003	483.94	1.077s
PA-234	524.68	131.28	427.	-34.	-0.009	175.34	1.087s
U-235	574.60	143.76	470.	10.	0.003	610.31	1.101s
U-235	652.96	163.35	234.	25.	0.007	197.59	1.123s
RA-226	743.92	186.09	125.	73.	0.020	57.54	1.460s
U-235	820.81	205.31	210.	-12.	-0.003	401.04	1.171s
PA-234	907.06	226.87	291.	-25.	-0.007	199.25	1.196s
PB-212	954.10	238.63	67.	352.	0.098	12.53	1.209D
PB-214	967.51	241.98	92.	70.	0.019	45.73	1.212D
EU-152	978.26	244.67	861.	-25.	-0.007	335.24	1.216s
EU-154	991.75	248.04	809.	-24.	-0.007	332.71	1.219s
TL-208	1109.04	277.36	126.	5.	0.001	743.18	1.252
PB-214	1180.46	295.21	58.	116.	0.032	26.33	1.272D
PB-212	1199.97	300.09	304.	21.	0.006	239.85	1.277s
Ra-228	1351.19	337.89	56.	73.	0.020	42.53	1.007
EU-152	1376.85	344.30	102.	6.	0.002	579.08	1.326
PB-214	1406.58	351.73	84.	174.	0.048	25.24	1.402
TL-208	2042.72	510.72	106.	149.	0.041	33.52	2.754
TL-208	2333.26	583.33	27.	122.	0.034	23.61	1.387
EU-154	2366.77	591.70	42.	1.	0.000	1631.07	1.588s
BI-214	2437.25	609.31	51.	143.	0.040	24.32	1.606
CS-137	2646.75	661.66	61.	8.	0.002	371.36	1.659s
PA-234	2796.59	699.10	82.	-3.	-0.001	861.52	1.696s
EU-154	2893.44	723.30	147.	-10.	-0.003	358.63	1.720s
BI-212	2908.93	727.17	125.	19.	0.005	176.16	1.724s
PA-234	2932.26	733.00	129.	7.	0.002	474.92	1.730s
EU-154	3027.12	756.70	135.	16.	0.005	206.60	1.753s
TL-208	3053.54	763.30	150.	7.	0.002	532.00	1.760s
BI-214	3073.77	768.36	144.	3.	0.001	1340.92	1.764
EU-152	3115.98	778.90	103.	-21.	-0.006	144.26	1.775s

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Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
BI-212	3142.07	785.42	87.	16.	0.004	173.03	1.781s
PA-234	3232.85	808.10	47.	6.	0.002	420.59	1.803s
PA-234	3324.91	831.10	54.	-5.	-0.001	557.14	1.825s
TL-208	3442.48	860.47	265.	-21.	-0.006	221.72	1.853s
EU-152	3470.18	867.39	273.	-21.	-0.006	224.07	1.859s
EU-154	3493.43	873.20	294.	-21.	-0.006	231.65	1.865s
PA-234	3522.70	880.51	316.	-11.	-0.003	451.00	1.872s
PA-234	3533.62	883.24	327.	0.	0.000	2000.00	1.874s
PA-234	3595.11	898.60	43.	-3.	-0.001	776.61	1.889
Ra-228	3645.71	911.24	16.	98.	0.027	26.03	1.435s
PA-234	3707.60	926.70	93.	-20.	-0.006	143.88	1.915s
BI-214	3737.06	934.06	130.	-13.	-0.003	264.36	1.922s
PA-234	3784.86	946.00	49.	5.	0.001	405.96	1.933s
PA-234	3796.87	949.00	77.	-20.	-0.006	131.91	1.936s
EU-152	3856.92	964.00	124.	-2.	-0.001	1576.45	1.949
Ra-228	3859.32	964.60	106.	0.	0.000	1833.03	1.950D
Ra-228	3876.53	968.90	30.	45.	0.013	45.41	1.954D
EU-154	3986.22	996.30	23.	8.	0.002	234.65	1.979s
EU-154	4020.25	1004.80	34.	3.	0.001	812.34	1.987s
EU-152	4344.54	1085.80	27.	5.	0.001	377.38	2.059s
EU-152	4449.72	1112.07	161.	-22.	-0.006	170.54	2.082s
BI-214	4482.62	1120.29	144.	22.	0.006	161.42	2.089
CO-60	4694.64	1173.24	48.	0.	0.000	2000.00	2.135s
BI-214	4954.40	1238.11	84.	-14.	-0.004	264.03	2.190
EU-154	5101.33	1274.80	52.	-13.	-0.004	226.00	2.221s
CO-60	5332.40	1332.50	24.	0.	0.000	2000.00	2.268s
BI-214	5513.29	1377.67	25.	8.	0.002	270.29	2.305s
PA-234	5579.09	1394.10	21.	-1.	0.000	1866.55	2.318s
EU-152	5635.08	1408.08	21.	5.	0.001	381.79	2.329
K-40	5847.00	1460.99	5.	555.	0.154	8.71	2.252
BI-212	6486.16	1620.56	4.	7.	0.002	150.74	2.491s
BI-214	7062.79	1764.49	19.	21.	0.006	94.86	2.594s

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	- Average Code	Activity pCi/g	Energy keV	Activity pCi/g	Code	MDA Value pCi/g	COMMENTS
U-235		8.9099E-02				1.39E+09	
			143.76	3.560E-02	?(	3.656E-01	3.05E+02 1.05E+01 G
			205.31	1.141E-01	+	6.680E-01	2.01E+02 4.70E+00 G
			163.35	2.086E-01	?(6.175E-01	9.88E+01 4.70E+00 G

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Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
RA-226	8.4033E-01	186.21	8.403E-01	*(6.354E-01	2.88E+01	5.84E+05 3.64E+00 G K
Ra-228	3.8691E-01	911.07 968.90 338.40 964.60	4.194E-01 3.375E-01 3.803E-01 0.000E+00	(((}	9.058E-02 2.109E-01 1.958E-01 1.209E+00	1.30E+01 2.27E+01 2.13E+01 9.17E+02	2.10E+03 2.90E+01 G 1.75E+01 G 1.20E+01 G 5.45E+00 G
Am-241	T -9.2733E-02	59.54	-9.273E-02	?(	5.478E-01	1.78E+02	1.58E+05 3.59E+01 G K
PB-210	-1.1330E+00	46.52	-1.133E+00	?(	6.873E+00	1.83E+02	7.45E+03 4.00E+00 G
U-238	-8.1436E-01	63.29 92.80 92.38	-8.144E-01 -4.237E-01 -4.948E-01	?(+ &	4.931E+00 1.987E+00 2.354E+00	1.83E+02 1.41E+02 1.43E+02	1.63E+12 3.90E+00 G 3.00E+00 G 2.57E+00 G
K-40	9.5351E+00	1460.75	9.535E+00	(	2.237E-01	4.35E+00	4.68E+11 1.07E+01 G
PB-214	3.4404E-01	351.92 295.21 241.98	3.130E-01 3.562E-01 4.624E-01	( ( (	8.142E-02 1.178E-01 3.147E-01	1.26E+01 1.32E+01 2.29E+01	5.84E+05 3.58E+01 G 1.85E+01 G 7.50E+00 G
BI-214	3.0123E-01	609.31 1764.49 1120.29 1238.11 768.36 1377.67 934.06	2.990E-01 2.962E-01 2.157E-01 -3.795E-01 5.850E-02 3.468E-01 -5.249E-01	?(?(P - - & ?(-	7.548E-02 3.353E-01 5.798E-01 1.231E+00 1.349E+00 1.161E+00 2.347E+00	1.22E+01 4.74E+01 8.07E+01 1.32E+02 6.70E+02 1.35E+02 1.32E+02	5.84E+05 4.48E+01 G 1.54E+01 G 1.48E+01 G 5.86E+00 G 4.80E+00 G 3.92E+00 G 3.03E+00 G
BI-212	3.0915E-01	727.17 1620.56 785.42	1.670E-01 4.959E-01 8.912E-01	&( ?( &(	4.919E-01 9.216E-01 2.583E+00	8.81E+01 7.54E+01 8.65E+01	2.10E+03 1.18E+01 G 2.75E+00 G 2.00E+00 G
PB-212	3.9992E-01	238.63 300.09	4.023E-01 3.685E-01	(?(4.670E-02 1.479E+00	6.26E+00 1.20E+02	2.10E+03 4.31E+01 G 3.27E+00 G

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Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
TL-208	1.2875E-01					2.10E+03	
		583.14	1.287E-01	(	2.862E-02	1.18E+01	8.60E+01 G
		510.72	5.508E-01	+	1.870E-01	1.68E+01	2.25E+01 G
		860.47	2.111E-01	-	7.833E-01	1.11E+02	1.20E+01 G
		277.36	4.195E-02	-	4.616E-01	3.72E+02	6.50E+00 G
		763.30	4.255E-01	&	3.864E+00	2.66E+02	1.70E+00 G
PA-234	4.5958E-02					1.65E+12	
		98.44	5.286E-09	%(	2.374E-01	1.34E+09	2.51E+01 G
		946.00	3.208E-02	? (	2.266E-01	2.03E+02	2.00E+01 G
		131.28	6.093E-02	+	1.775E-01	8.77E+01	2.00E+01 G
		94.67	7.117E-02	&	3.823E-01	1.61E+02	1.55E+01 G
		883.24	0.000E+00	&	8.834E-01	1.00E+03	1.20E+01 G
		926.70	2.296E-01	+	5.484E-01	7.19E+01	1.10E+01 G
		569.26	1.721E-03	&	3.360E-01	6.87E+03	1.04E+01 G
		111.00	6.492E-03	%	3.505E-01	1.78E+03	8.55E+00 G
		733.00	8.603E-02	? (	6.984E-01	2.37E+02	8.50E+00 G
		949.00	3.298E-01	+	7.189E-01	6.60E+01	7.80E+00 G
		880.51	2.103E-01	+	1.600E+00	2.26E+02	6.50E+00 G
		226.87	1.813E-01	+	6.028E-01	9.96E+01	6.50E+00 G
		831.10	1.041E-01	+	7.696E-01	2.79E+02	5.60E+00 G
		808.10	1.446E-01	? (	8.068E-01	2.10E+02	4.90E+00 G
		99.70	1.751E-01	(	8.345E-01	1.43E+02	4.70E+00 G
		699.10	6.727E-02	+	1.007E+00	4.31E+02	4.60E+00 G
		898.60	9.879E-02	+	1.029E+00	3.88E+02	4.00E+00 G
		1394.10	4.516E-02	+	1.087E+00	9.33E+02	3.90E+00 G
CS-137	9.0870E-03					1.10E+04	
		661.66	9.087E-03	(	4.563E-02	1.86E+02	8.52E+01 G
EU-152	-1.1228E-01					4.64E+03	
		40.12	1.765E-01	&(	1.121E+00	1.92E+02	3.00E+01 G
		121.78	2.465E-02	+	6.552E-02	8.51E+01	2.92E+01 G
		344.30	1.407E-02	+	1.167E-01	2.90E+02	2.70E+01 G
		1408.08	4.190E-02	+	2.016E-01	1.91E+02	2.12E+01 G
		39.52	3.375E-01	+	2.153E+00	1.93E+02	1.60E+01 G
		964.00	1.791E-02	}	4.874E-01	7.88E+02	1.46E+01 G
		1112.07	2.328E-01	&	6.621E-01	8.53E+01	1.36E+01 G
		778.90	1.786E-01	&	4.277E-01	7.21E+01	1.30E+01 G
		1085.80	7.488E-02	? (	3.708E-01	1.89E+02	1.03E+01 G
		45.40	5.028E-01	+	3.134E+00	1.88E+02	9.00E+00 G
		244.67	1.640E-01	+	9.170E-01	1.68E+02	7.62E+00 G
		867.39	6.125E-01	+	2.296E+00	1.12E+02	4.18E+00 G
EU-154	3.8903E-02					3.10E+03	
		123.10	9.145E-03	&(	7.468E-02	2.42E+02	4.05E+01 G
		1274.80	5.963E-02	+	1.666E-01	1.13E+02	3.55E+01 G

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 11:28:33 AM
 AAA Spectrum name: ARS06052.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		723.30	-5.207E-02	&	3.172E-01	1.79E+02	1.97E+01 G
		1004.80	2.137E-02	?(	2.287E-01	4.06E+02	1.76E+01 G
		43.00	-3.698E-01	&	2.322E+00	1.90E+02	1.31E+01 G
		873.20	-2.281E-01	+	8.842E-01	1.16E+02	1.13E+01 G
		996.30	1.023E-01	&(	3.113E-01	1.17E+02	1.07E+01 G
		42.31	-6.774E-01	+	4.274E+00	1.91E+02	7.30E+00 G
		248.04	-1.866E-01	+	1.036E+00	1.66E+02	6.60E+00 G
		591.70	2.797E-02	&(	6.546E-01	8.16E+02	4.60E+00 G
		48.70	-1.014E+00	+	6.107E+00	1.82E+02	4.20E+00 G
		756.70	4.352E-01	&(	1.511E+00	1.03E+02	4.10E+00 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

! - Peak is part of a multiplet and this area went negative during deconvolution.

? - Peak is too narrow.

@ - Peak is too wide at FW25M, but ok at FWHM.

% - Peak fails sensitivity test.

\$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

+ - Peak activity higher than counting uncertainty range.

- - Peak activity lower than counting uncertainty range.

= - Peak outside analysis energy range.

& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.

P - Peakbackground subtraction

} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:

T - Thermal Neutron Activation
 F - Fast Neutron Activation
 I - Fission Product
 N - Naturally Occurring Isotope
 P - Photon Reaction
 C - Charged Particle Reaction
 M - No MDA Calculation
 R - Coincidence Corrected
 H - Halflife limit exceeded

Peak Codes:

G - Gamma Ray
 X - X-Ray
 P - Positron Decay
 S - Single-Escape
 D - Double-Escape
 K - Key Line
 A - Not in Average
 C - Coincidence Peak

***** D I S C A R D E D I S O T O P E P E A K S *****

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
EU-154	42.31	7972.	-66.	-0.018	381.27	-6.774E-01
EU-154	43.00	7906.	-66.	-0.018	379.35	-3.698E-01
PB-210	46.52	7858.	-69.	-0.019	366.58	-1.133E+00
EU-154	48.70	7789.	-69.	-0.019	364.12	-1.014E+00
Am-241	59.54	7682.	-70.	-0.019	356.96	-9.273E-02

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 11:28:33 AM
 AAA Spectrum name: ARS06052.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
U-238	63.29	8392.	-71.	-0.020	365.93	-8.144E-01	
U-238	92.38	1318.	-36.	-0.010	286.10	-4.948E-01	
U-238	92.80	1282.	-36.	-0.010	282.05	-4.237E-01	
PA-234	94.67	1278.	-32.	-0.009	322.79	-7.117E-02	
PA-234	99.70	559.	24.	0.007	285.21	1.751E-01	
EU-154	123.10	318.	-10.	-0.003	483.94	-9.145E-03	
PA-234	131.28	427.	-34.	-0.009	175.34	-6.093E-02	
U-235	143.76	470.	10.	0.003	610.31	3.560E-02	
U-235	163.35	234.	25.	0.007	197.59	2.086E-01	
U-235	205.31	210.	-12.	-0.003	401.04	-1.141E-01	
PA-234	226.87	291.	-25.	-0.007	199.25	-1.813E-01	
EU-154	248.04	809.	-24.	-0.007	332.71	-1.866E-01	
EU-154	591.70	42.	1.	0.000	1631.07	2.797E-02	
CS-137	661.66	61.	8.	0.002	371.36	9.087E-03	
PA-234	699.10	82.	-3.	-0.001	861.52	-6.727E-02	
EU-154	723.30	147.	-10.	-0.003	358.63	-5.207E-02	
PA-234	733.00	129.	7.	0.002	474.92	8.603E-02	
EU-154	756.70	135.	16.	0.005	206.60	4.352E-01	
PA-234	808.10	47.	6.	0.002	420.59	1.446E-01	
PA-234	831.10	54.	-5.	-0.001	557.14	-1.041E-01	
EU-154	873.20	294.	-21.	-0.006	231.65	-2.281E-01	
PA-234	880.51	316.	-11.	-0.003	451.00	-2.103E-01	
PA-234	898.60	43.	-3.	-0.001	776.61	-9.879E-02	
PA-234	926.70	93.	-20.	-0.006	143.88	-2.296E-01	
PA-234	946.00	49.	5.	0.001	405.96	3.208E-02	
PA-234	949.00	77.	-20.	-0.006	131.91	-3.298E-01	
EU-154	996.30	23.	8.	0.002	234.65	1.023E-01	
EU-154	1004.80	34.	3.	0.001	812.34	2.137E-02	
EU-154	1274.80	52.	-13.	-0.004	226.00	-5.963E-02	
PA-234	1394.10	21.	-1.	0.000	1866.55	-4.516E-02	

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count	Uncertainty	2 Sigma	MDA
	Activity	Counting	Total	
	pCi/g	pCi/g	pCi/g	pCi/g
U-235 #A	8.9099E-02	1.7605E-01	1.7615E-01	0.366E+00
RA-226 #	8.4033E-01	4.8352E-01	4.8591E-01	0.635E+00
Ra-228	3.8691E-01	8.6985E-02	9.0331E-02	0.906E-01
Am-241 #A	-9.2733E-02	3.3102E-01	3.3107E-01	0.548E+00
PB-210 #A	-1.1330E+00	4.1533E+00	4.1547E+00	0.687E+01
U-238 #A	-8.1436E-01	2.9800E+00	2.9807E+00	0.493E+01
K-40	9.5351E+00	8.3023E-01	1.0310E+00	0.224E+00
PB-214	3.4404E-01	6.7079E-02	7.2910E-02	0.814E-01
BI-214	3.0123E-01	7.3258E-02	7.5406E-02	0.755E-01
BI-212 #A	3.0915E-01	2.9812E-01	2.9876E-01	0.492E+00

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 11:28:33 AM
 AAA Spectrum name: ARS06052.An1

PB-212	3.9992E-01	5.0095E-02	5.7292E-02	0.467E-01
TL-208	1.2875E-01	3.0391E-02	3.1432E-02	0.286E-01
PA-234 #A	4.5958E-02	1.3108E-01	1.3112E-01	0.237E+00
CS-137 #A	9.0870E-03	3.3746E-02	3.3748E-02	0.456E-01
CO-60 #A	0.0000E+00	2.7197E-02	2.7197E-02	0.532E-01
EU-152 A	-1.1228E-01	3.0222E-01	3.0247E-01	0.112E+01
EU-154 #A	3.8903E-02	8.0375E-02	8.0417E-02	0.747E-01


- All peaks for activity calculation had bad shape.
 * - Activity omitted from total
 & - Activity omitted from total and all peaks had bad shape.
 < - MDA value printed.
 A - Activity printed, but activity < MDA.
 B - Activity < MDA and failed test.
 C - Area < Critical level.
 F - Failed fraction or key line test.
 H - Halflife limit exceeded

----- S U M M A R Y -----
 Total Activity (2.6 to 1998.4 keV) 1.194E+01 pCi/g

Analyzed by: _____
 Countroom

Reviewed by: _____
 Supervisor

Laboratory: AAA

 Ortec Gamma		Batch Sample ID	ARS1-B23-01775-07		
		Analytical Batch	ARS1-B23-01775	Analysis Date	9/29/2023 10:29
		Analysis Code	GAM-IG21-SO	SDG	ARS1-23-01973
		Detector	(ARS03) MCB 129	Fraction	004
		Count Time (sec)	3600	Run	1
		Library	ITSI COUNT.Lib		
		Geometry	250mL tuna can poly 1948-64-2		
Isotope	Activity	Units	CSU	MDA	DL
Am-241	2.0741E-002	pCi/g	9.8169E-002	1.6500E-001	8.2500E-002
Bi-212	3.1542E-001	pCi/g	1.9660E-001	2.3100E-001	1.1550E-001
Bi-214	3.5392E-001	pCi/g	8.7456E-002	8.9100E-002	4.4550E-002
Co-60	3.4021E-002	pCi/g	3.7732E-002	4.7600E-002	2.3800E-002
Cs-137	3.0535E-003	pCi/g	3.3976E-002	5.0200E-002	2.5100E-002
Eu-152	2.0655E-002	pCi/g	6.6747E-002	1.1500E-001	5.7500E-002
Eu-154	6.8908E-002	pCi/g	1.1612E-001	7.0700E-002	3.5350E-002
K-40	-5.2081E-001	pCi/g	2.9202E-001	2.2700E+000	1.1350E+000
Pa-234	1.0478E-001	pCi/g	7.4639E-002	2.1300E-001	1.0650E-001
Pb-210	-5.5076E-001	pCi/g	1.3085E+000	2.2100E+000	1.1050E+000
Pb-212	3.7230E-001	pCi/g	6.7562E-002	6.9400E-002	3.4700E-002
Pb-214	3.7797E-001	pCi/g	7.7213E-002	9.7200E-002	4.8600E-002
Ra-226	6.9010E-001	pCi/g	5.5950E-001	8.0800E-001	4.0400E-001
Ra-228	3.3683E-001	pCi/g	1.0979E-001	1.9100E-001	9.5500E-002
Tl-208	1.0664E-001	pCi/g	3.3320E-002	3.5400E-002	1.7700E-002
U-235	-1.0053E-001	pCi/g	2.2003E-001	3.6700E-001	1.8350E-001
U-238	2.3556E-001	pCi/g	5.7681E-001	9.0500E-001	4.5250E-001

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 11:29:28 AM
 AAA Spectrum name: ARS03248.An1

Sample description

Batch ID: 23-01775-07
 SDG ID: ARS1-23-01973-004 Tech: SDW

Spectrum Filename: C:\User\ARS03248.An1

Acquisition information

Start time: 9/29/2023 10:29:12 AM
 Live time: 3600
 Real time: 3603
 Dead time: 0.09 %
 Detector ID: 17

Detector system

(ARS03) MCB 129

Calibration

Filename: 1948-64-2 250mL tc poly cal 12-15-17.Clb
 250mL tuna can poly 1948-64-2
 12-15-17 EEC

Energy Calibration

Created: 12/15/2017 11:10:20 AM
 Zero offset: 0.253 keV
 Gain: 0.250 keV/channel
 Quadratic: -1.778E-08 keV/channel^2

Efficiency Calibration

Created: 12/15/2017 12:18:46 PM
 Type: Polynomial
 Uncertainty: 1.552 %
 Coefficients: -0.414479 -4.439273 0.364604
 -0.031228 0.000978 -0.000011

Library Files

Main analysis library: ITSI COUNT.Lib
 Library Match Width: 0.500
 Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G800W064
 Start channel: 10 (2.75keV)
 Stop channel: 8000 (1997.02keV)
 Peak rejection level: 1000.000%
 Peak search sensitivity: 1
 Sample Size: 3.9674E+02 +/- 0.000E+00%
 Activity scaling factor: 1.0000E+06/(1.0000E+00* 3.9674E+02) =
 2.5205E+03
 Detection limit method: Reg. Guide 4.16 Method
 Random error: 1.0000000E+00
 Systematic error: 1.0000000E+00
 Fraction Limit: 0.000%
 Background width: 5
 Half lives decay limit: 12.000

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 AAA Spectrum name: ARS03248.An1

Activity range factor: 2.000
 Min. step backg. energy 0.000
 Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	NO	
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	ITSI.Pbc 9/21/2023 8:26:46 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 0 cutoff: 0.00E+00 %
 Energy Calibration
 Normalized diff: 0.1621

***** S U M M A R Y O F P E A K S I N R A N G E *****								
Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
20.48	6.	116.90	0.00	1.197E-02				
37.23	15.	76.63	0.87	2.131E-02				
40.99	8.	161.48	0.87	2.341E-02				
46.66	54.	29.01	0.87	2.648E-02	46.52	4.000	PBC<MDA	PB210
48.04	8.	182.38	0.88	2.732E-02	48.70	4.200	1.344E-01	EU154
59.54	14.	236.63	0.89	3.431E-02	59.54	35.900	PBC<MDA	Am241
63.38	64.	31.78	0.45	3.642E-02	63.29	3.900	PBC<MDA	U238
74.86	81.	25.56	0.90	4.144E-02				
77.17	189.	11.57	0.90	4.219E-02				
84.22	36.	48.58	0.91	4.395E-02				
87.37	75.	26.19	0.91	4.452E-02				
92.68	107.	18.23	0.91	4.521E-02	92.38	2.570	1.325E+00	U238
					92.80	3.000	PBC<MDA	U238
95.09	7.	219.67	0.92	4.541E-02	94.67	15.500	PBC<MDA	PA234
105.67	13.	89.51	0.36	4.565E-02				
121.78	6.	302.88	0.94	4.465E-02	121.78	29.240	PBC<MDA	EU152
123.10	20.	98.99	0.94	4.452E-02	123.10	40.460	PBC<MDA	EU154
142.02	13.	94.63	0.96	4.222E-02				
146.00	25.	52.36	0.96	4.169E-02				
172.26	30.	41.21	0.98	3.809E-02				
175.19	29.	40.22	0.99	3.769E-02				
186.03	82.	22.14	1.18	3.630E-02	186.21	3.640	PBC<MDA	RA226
209.26	38.	36.47	0.81	3.352E-02				
221.01	13.	73.38	0.31	3.225E-02				
226.87	4.	539.36	1.03	3.164E-02	226.87	6.500	PBC<MDA	PA234
238.54	266.	8.46	1.07	3.051E-02	238.63	43.100	3.429E-01	PB212
241.95	30.	51.76	1.05	3.019E-02	241.98	7.500	PBC<MDA	PB214

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 AAA Spectrum name: ARS03248.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
248.04	19.	192.91	1.05	2.965E-02	248.04	6.600	PBC<MDA	EU154
270.08	33.	43.04	0.66	2.783E-02				
277.36	5.	344.32	1.08	2.728E-02	277.36	6.500	PBC<MDA	TL208
295.16	116.	16.04	1.14	2.604E-02	295.21	18.500	3.996E-01	PB214
300.07	23.	47.89	1.10	2.572E-02	300.09	3.270	PBC<MDA	PB212
327.96	20.	49.61	1.12	2.406E-02				
330.10	14.	71.68	1.12	2.394E-02				
338.31	56.	22.18	1.31	2.351E-02	338.40	12.010	3.586E-01	Ra228
351.99	181.	9.14	1.14	2.283E-02	351.92	35.800	3.636E-01	PB214
353.72	9.	194.54	1.14	2.274E-02				
423.23	14.	40.26	0.45	1.994E-02				
432.32	14.	78.90	0.45	1.964E-02				
510.97	182.	11.66	2.30	1.742E-02	510.72	22.500	8.763E-01	TL208
569.26	10.	100.06	1.32	1.615E-02	569.26	10.400	PBC<MDA	PA234
583.39	87.	12.86	1.36	1.587E-02	583.14	86.000	1.066E-01	TL208
591.70	7.	191.78	1.34	1.572E-02	591.70	4.600	PBC<MDA	EU154
597.54	24.	33.88	1.16	1.561E-02				
609.60	144.	10.01	0.90	1.540E-02	609.31	44.791	3.489E-01	BI214
661.66	2.	556.33	1.40	1.455E-02	661.66	85.210	PBC<MDA	CS137
727.98	27.	31.00	0.68	1.361E-02	727.17	11.800	2.856E-01	BI212
733.00	13.	102.25	1.46	1.355E-02	733.00	8.500	PBC<MDA	PA234
795.77	32.	22.67	0.85	1.280E-02				
831.10	6.	144.70	1.54	1.242E-02	831.10	5.600	PBC<MDA	PA234
861.44	13.	79.75	1.56	1.212E-02	860.47	12.000	PBC<MDA	TL208
867.39	3.	314.25	1.56	1.205E-02	867.39	4.176	PBC<MDA	EU152
880.51	10.	76.39	1.58	1.193E-02	880.51	6.500	PBC<MDA	PA234
898.85	10.	40.18	0.48	1.175E-02	898.60	4.000	PBC<MDA	PA234
911.43	90.	13.93	1.49	1.164E-02	911.07	29.000	4.783E-01	Ra228
926.70	8.	111.52	1.61	1.150E-02	926.70	11.000	PBC<MDA	PA234
949.00	7.	149.43	1.63	1.131E-02	949.00	7.800	PBC<MDA	PA234
964.60	3.	518.30	1.64	1.118E-02	964.00	14.580	PBC<MDA	EU152
					964.60	5.452	PBC<MDA	Ra228
969.48	40.	24.14	0.43	1.114E-02	968.90	17.460	3.378E-01	Ra228
996.30	3.	343.60	1.67	1.092E-02	996.30	10.700	PBC<MDA	EU154
1004.80	6.	168.54	1.67	1.086E-02	1004.80	17.600	PBC<MDA	EU154
1085.80	4.	216.58	1.74	1.026E-02	1085.80	10.290	PBC<MDA	EU152
1120.45	45.	19.90	1.08	1.003E-02	1120.29	14.797	4.989E-01	BI214
1173.24	17.	55.42	1.80	9.688E-03	1173.24	99.900	HL>Cutoff	CO60
1239.13	15.	79.16	1.85	9.299E-03	1238.11	5.859	PBC<MDA	BI214
1377.33	7.	98.58	1.96	8.551E-03	1377.67	3.919	PBC<MDA	BI214
1394.10	11.	35.43	1.97	8.470E-03	1394.10	3.900	6.027E-01	PA234
1461.37	451.	4.71	1.62	8.150E-03	1460.75	10.700	9.499E+00	K40
1765.02	27.	23.40	0.72	6.915E-03	1764.49	15.357	PBC<MDA	BI214

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 11:29:28 AM
 AAA Spectrum name: ARS03248.An1

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***** U N I D E N T I F I E D      P E A K      S U M M A R Y *****
Peak Centroid Background Net Area Efficiency Uncert FWHM Suspected
Channel Energy Counts Counts * Area 2 Sigma % keV Nuclide

81.00 20.48 27. 6. 5.013E+02 233.81 0.000 -
148.08 37.20 58. 15. 7.004E+02 153.25 0.866 CE-141
192.08 48.09 105. 9. 3.138E+02 345.51 0.876 EU-154
298.73 74.89 171. 81. 1.943E+03 51.13 0.899 TH-234 sD
308.00 77.20 144. 189. 4.474E+03 23.14 0.901 PB-212 D
336.23 84.16 138. 36. 8.268E+02 97.16 0.907 HG-203 sD
348.84 87.31 153. 75. 1.675E+03 52.37 0.910 PB-212 sD
380.17 95.15 103. 7. 1.602E+02 400.87 0.917 AC-228 sc
422.11 105.67 68. 13. 2.848E+02 179.02 0.364 AC-228 sc
567.67 142.23 72. 13. 3.140E+02 189.25 0.958 FE-59 sc
583.60 146.21 72. 25. 5.958E+02 104.73 0.962 EU-155 sD
688.77 172.43 59. 30. 7.763E+02 82.42 0.985 GD-153 sD
700.52 175.36 55. 29. 7.791E+02 80.44 0.987 SB-125 sD
836.95 209.26 68. 38. 1.122E+03 72.95 0.809 AC-228
884.00 221.01 39. 13. 4.032E+02 146.76 0.311 KR-89 c
1080.53 270.04 63. 33. 1.189E+03 86.07 0.665 AC-228 sM
1312.32 328.10 41. 20. 8.433E+02 99.23 1.120 BI-207 sD
1320.91 330.24 42. 14. 5.774E+02 143.35 1.122 TH-227 sc
1416.09 353.80 109. 10. 4.336E+02 306.36 1.142 CO-57 sc
1693.88 423.23 9. 14. 7.121E+02 80.52 0.449 J-133 s
1730.29 432.32 36. 14. 7.130E+02 157.79 0.449 LA-140 s
2392.08 597.54 14. 24. 1.512E+03 67.75 1.157 J-134 s
3186.15 795.77 7. 32. 2.484E+03 45.34 0.849 CS-134 s
3599.09 898.85 2. 10. 8.167E+02 80.36 0.481 K-42 s
3652.40 912.11 79. 24. 2.079E+03 111.84 1.600 AC-228 sD
5853.05 1461.37 0. 451. 5.534E+04 9.42 1.622 K-40 M
```

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 L - Peak written from unknown list.
 C - Area < Critical level.
 M - Peak is close to a library peak.

 This section based on library: ITSI COUNT.Lib

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 11:29:28 AM
 AAA Spectrum name: ARS03248.An1

***** I D E N T I F I E D P E A K S U M M A R Y *****

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma	FWHM % keV
EU-152	157.23	39.52	677.	-22.	-0.006	343.92	0.868
EU-152	159.64	40.12	70.	8.	0.002	322.96	0.869D
EU-154	168.41	42.31	634.	-18.	-0.005	402.81	0.870
PB-210	185.26	46.52	669.	-31.	-0.009	237.38	0.874s
EU-154	193.99	48.70	524.	21.	0.006	315.55	0.876s
Am-241	237.40	59.54	504.	14.	0.004	473.26	0.886
U-238	252.79	63.38	195.	18.	0.005	244.74	0.449s
U-238	368.90	92.38	244.	14.	0.004	292.09	0.915D
U-238	370.59	92.80	678.	17.	0.005	257.07	0.915D
PA-234	378.07	94.67	672.	23.	0.007	318.01	0.917D
PA-234	393.17	98.44	731.	-29.	-0.008	259.62	0.920s
PA-234	398.22	99.70	757.	-29.	-0.008	264.02	0.921s
PA-234	443.47	111.00	221.	-16.	-0.004	494.46	0.931s
EU-152	486.63	121.78	186.	6.	0.002	605.76	0.941
EU-154	491.92	123.10	192.	20.	0.006	197.99	0.942s
PA-234	524.68	131.28	226.	-11.	-0.003	434.16	0.949s
U-235	574.65	143.76	317.	-23.	-0.007	218.77	0.960s
U-235	653.10	163.35	211.	-15.	-0.004	318.65	0.977s
RA-226	743.91	186.03	133.	48.	0.013	80.83	1.181s
U-235	821.14	205.31	326.	-24.	-0.007	221.16	1.014s
PA-234	907.48	226.87	146.	4.	0.001	1078.71	1.032s
PB-212	954.57	238.63	95.	259.	0.072	16.49	1.043D
PB-214	967.99	241.98	107.	30.	0.008	103.52	1.046D
EU-152	978.76	244.67	703.	-15.	-0.004	511.86	1.048
EU-154	992.26	248.04	641.	19.	0.005	385.81	1.051s
TL-208	1109.68	277.36	106.	5.	0.001	688.65	1.076
PB-214	1181.18	295.21	60.	103.	0.029	29.48	1.092D
PB-212	1200.71	300.09	44.	23.	0.006	95.78	1.096D
Ra-228	1353.80	338.31	45.	54.	0.015	48.21	1.311
EU-152	1377.77	344.30	114.	-20.	-0.006	172.62	1.134
PB-214	1408.29	351.92	71.	157.	0.044	22.39	1.140D
TL-208	2045.31	510.97	42.	182.	0.050	23.33	2.302
PA-234	2278.79	569.26	31.	10.	0.003	200.11	1.323s
TL-208	2335.38	583.39	24.	77.	0.021	30.60	1.364
EU-154	2368.67	591.70	84.	7.	0.002	383.55	1.342
BI-214	2440.38	609.60	41.	127.	0.035	23.97	0.902s
CS-137	2648.91	661.66	42.	2.	0.001	1112.65	1.399s
PA-234	2798.88	699.10	57.	-9.	-0.002	293.38	1.430s
EU-154	2895.82	723.30	120.	-14.	-0.004	226.58	1.449s
BI-212	2914.57	727.98	13.	27.	0.007	62.01	0.685
PA-234	2934.68	733.00	82.	13.	0.004	204.51	1.457s
EU-154	3029.62	756.70	61.	-12.	-0.003	239.86	1.476
TL-208	3056.06	763.30	65.	-6.	-0.002	401.25	1.482
BI-214	3076.31	768.36	91.	-3.	-0.001	366.81	1.486s

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 11:29:28 AM
 AAA Spectrum name: ARS03248.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-152	3118.55	778.90	58.	-17.	-0.005	168.31	1.494
BI-212	3144.67	785.42	47.	-4.	-0.001	296.99	1.499
PA-234	3327.67	831.10	26.	6.	0.002	289.40	1.536s
TL-208	3445.33	860.47	32.	13.	0.004	159.50	1.559s
EU-152	3473.05	867.39	46.	3.	0.001	628.49	1.565
PA-234	3525.61	880.51	26.	10.	0.003	152.77	1.575
PA-234	3536.55	883.24	49.	-5.	-0.001	397.99	1.578s
PA-234	3598.08	898.60	26.	-2.	-0.001	626.08	1.590s
Ra-228	3648.04	911.07	45.	58.	0.016	42.03	1.600D
PA-234	3710.66	926.70	26.	8.	0.002	223.05	1.612s
BI-214	3740.15	934.06	51.	-6.	-0.002	414.26	1.618s
PA-234	3787.98	946.00	46.	-12.	-0.003	169.97	1.627s
PA-234	3800.00	949.00	51.	7.	0.002	298.86	1.629s
EU-152	3860.10	964.00	97.	-2.	0.000	1727.45	1.641
Ra-228	3862.50	964.60	92.	3.	0.001	1036.60	1.642
Ra-228	3879.73	968.90	26.	20.	0.006	86.62	1.645D
EU-154	3989.51	996.30	27.	3.	0.001	687.20	1.667s
EU-154	4023.56	1004.80	27.	6.	0.002	337.09	1.673s
EU-152	4348.09	1085.80	24.	4.	0.001	433.15	1.736
BI-214	4486.94	1120.45	17.	39.	0.011	47.76	1.080s
CO-60	4698.44	1173.24	22.	17.	0.005	110.85	1.802
BI-214	4958.38	1238.11	36.	15.	0.004	158.32	1.852s
EU-154	5105.40	1274.80	36.	-3.	-0.001	757.19	1.879s
CO-60	5336.62	1332.50	47.	-19.	-0.005	144.52	1.922s
BI-214	5517.62	1377.67	12.	7.	0.002	197.15	1.955s
PA-234	5583.46	1394.10	0.	11.	0.003	70.85	1.967s
EU-152	5639.49	1408.08	11.	-1.	0.000	943.07	1.978
K-40	5850.56	1460.75	481.	-24.	-0.007	55.70	2.016
BI-212	6491.04	1620.56	13.	-3.	-0.001	422.32	2.130
BI-214	7067.93	1764.49	22.	13.	0.004	149.38	2.231s

s - Peak fails shape tests.

D - Peak area deconvoluted.

A Derived peak area.

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***** S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide - Average ----- Peak -----
Name  Code  Activity      Energy  Activity Code MDA Value
      pCi/g      keV      pCi/g      pCi/g
-----
U-235      -1.0053E-01                                1.39E+09
          143.76-1.005E-01 ?(  3.674E-01 1.09E+02 1.05E+01 G
          205.31-2.787E-01 &   1.030E+00 1.11E+02 4.70E+00 G
          163.35-1.495E-01 &   7.202E-01 1.59E+02 4.70E+00 G

RA-226      6.9010E-01                                5.84E+05
          186.21 6.901E-01  (P 8.085E-01 4.04E+01 3.64E+00 G K

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ORTEC g v - i (3263) Env32 G800W064 9/29/2023 11:29:28 AM
 AAA Spectrum name: ARS03248.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Ra-228	3.3683E-01					2.10E+03	
		911.07	3.278E-01	(P	1.912E-01	2.10E+01	2.90E+01 G
		968.90	1.938E-01	- P	2.577E-01	4.33E+01	1.75E+01 G
		338.40	3.586E-01	(P	2.288E-01	2.41E+01	1.20E+01 G
		964.60	8.264E-02	- P	1.474E+00	5.18E+02	5.45E+00 G
Am-241	T 2.0741E-02					1.58E+05	
		59.54	2.074E-02	&(	1.648E-01	2.37E+02	3.59E+01 G K
PB-210	-5.5076E-01					7.45E+03	
		46.52	-5.508E-01	?(P	2.211E+00	1.19E+02	4.00E+00 G
U-238	2.3556E-01					1.63E+12	
		63.29	2.356E-01	(P	9.049E-01	1.22E+02	3.90E+00 G
		92.80	2.356E-01	} P	1.731E+00	1.29E+02	3.00E+00 G
		92.38	2.356E-01	} P	1.232E+00	1.46E+02	2.57E+00 G
K-40	-5.2081E-01					4.68E+11	
		1460.75	-5.208E-01	(P	2.275E+00	2.79E+01	1.07E+01 G
PB-214	3.7797E-01					5.84E+05	
		351.92	3.639E-01	(P	9.720E-02	1.12E+01	3.58E+01 G
		295.21	4.051E-01	(P	1.523E-01	1.47E+01	1.85E+01 G
		241.98	2.542E-01	- P	4.247E-01	5.18E+01	7.50E+00 G
BI-214	3.5392E-01					5.84E+05	
		609.31	3.489E-01	(P	8.908E-02	1.20E+01	4.48E+01 G
		1764.49	2.259E-01	- P	4.405E-01	7.47E+01	1.54E+01 G
		1120.29	4.989E-01	+ P	2.787E-01	2.39E+01	1.48E+01 G
		1238.11	5.210E-01	&	1.065E+00	7.92E+01	5.86E+00 G
		768.36	-7.817E-02	& P	1.419E+00	1.83E+02	4.80E+00 G
		1377.67	4.111E-01	?(P	1.054E+00	9.86E+01	3.92E+00 G
		934.06	-3.386E-01	-	1.969E+00	2.07E+02	3.03E+00 G
BI-212	3.1542E-01					2.10E+03	
		727.17	3.154E-01	(P	2.312E-01	3.10E+01	1.18E+01 G
		1620.56	-3.097E-01	+ P	1.820E+00	2.11E+02	2.75E+00 G
		785.42	-2.908E-01	+ P	2.538E+00	1.48E+02	2.00E+00 G
PB-212	3.7230E-01					2.10E+03	
		238.63	3.723E-01	(P	6.941E-02	8.24E+00	4.31E+01 G
		300.09	5.179E-01	+ P	7.564E-01	4.79E+01	3.27E+00 G
TL-208	1.0664E-01					2.10E+03	
		583.14	1.066E-01	(P	3.541E-02	1.53E+01	8.60E+01 G
		510.72	8.763E-01	+	1.595E-01	1.17E+01	2.25E+01 G
		860.47	1.730E-01	&	3.782E-01	7.98E+01	1.20E+01 G

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 11:29:28 AM
 AAA Spectrum name: ARS03248.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		277.36	5.186E-02	- P	5.413E-01	3.44E+02	6.50E+00 G
		763.30	4.900E-01	-	3.398E+00	2.01E+02	1.70E+00 G
PA-234	1.0478E-01					1.65E+12	
		98.44	4.797E-02	?(P	2.128E-01	1.30E+02	2.51E+01 G
		946.00	1.002E-01	&	2.864E-01	8.50E+01	2.00E+01 G
		131.28	2.299E-02	+	1.577E-01	2.17E+02	2.00E+01 G
		94.67	6.305E-02	?(P	3.323E-01	1.59E+02	1.55E+01 G
		883.24	6.769E-02	+	4.686E-01	1.99E+02	1.20E+01 G
		926.70	1.256E-01	?(	3.931E-01	1.12E+02	1.10E+01 G
		569.26	1.159E-01	*(P	3.229E-01	1.00E+02	1.04E+01 G
		111.00	7.575E-02	+ P	3.501E-01	2.47E+02	8.55E+00 G
		733.00	2.141E-01	&(	7.391E-01	1.02E+02	8.50E+00 G
		949.00	1.524E-01	&(P	7.712E-01	1.49E+02	7.80E+00 G
		880.51	2.541E-01	?(	6.506E-01	7.64E+01	6.50E+00 G
		226.87	3.324E-02	&(P	5.436E-01	5.39E+02	6.50E+00 G
		831.10	1.741E-01	?(	7.153E-01	1.45E+02	5.60E+00 G
		808.10	1.830E-02	%	9.992E-01	1.90E+03	4.90E+00 G
		99.70	2.542E-01	+ P	1.156E+00	1.32E+02	4.70E+00 G
		699.10	2.644E-01	+	1.113E+00	1.47E+02	4.60E+00 G
		898.60	8.450E-02	+ P	1.067E+00	3.13E+02	4.00E+00 G
		1394.10	6.027E-01	?(P	4.222E-01	3.54E+01	3.90E+00 G
CS-137	3.0535E-03					1.10E+04	
		661.66	3.054E-03	&(	5.025E-02	5.56E+02	8.52E+01 G
CO-60	3.4021E-02					1.93E+03	
		1173.24	3.402E-02	?(	4.764E-02	5.54E+01	9.99E+01 K
		1332.50	4.029E-02	-	7.455E-02	7.23E+01	1.00E+02 K
EU-152	2.0655E-02					4.64E+03	
		40.12	2.065E-02	!(	1.145E-01	1.61E+02	3.00E+01 G
		121.78	9.299E-03	+	9.594E-02	3.03E+02	2.92E+01 G
		344.30	6.123E-02	+	1.587E-01	8.63E+01	2.70E+01 G
		1408.08	1.487E-02	+	1.959E-01	4.72E+02	2.12E+01 G
		39.52	1.128E-01	+	6.484E-01	1.72E+02	1.60E+01 G
		964.00	1.875E-02	+	5.629E-01	8.64E+02	1.46E+01 G
		1112.07	5.528E-03	%	4.313E-01	2.78E+03	1.36E+01 G
		778.90	1.861E-01	+	4.269E-01	8.42E+01	1.30E+01 G
		1085.80	7.526E-02	(	4.559E-01	2.17E+02	1.03E+01 G
		45.40	3.097E-08	%	9.611E-01	9.20E+08	9.00E+00 G
		244.67	1.222E-01	+	1.047E+00	2.56E+02	7.62E+00 G
		867.39	1.165E-01	(	1.289E+00	3.14E+02	4.18E+00 G
EU-154	6.8908E-02					3.10E+03	
		123.10	2.134E-02	(	7.068E-02	9.90E+01	4.05E+01 G
		1274.80	1.759E-02	-	1.798E-01	3.79E+02	3.55E+01 G
		723.30	9.898E-02	&	3.782E-01	1.13E+02	1.97E+01 G

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 11:29:28 AM
 AAA Spectrum name: ARS03248.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		1004.80	5.743E-02	?(	2.675E-01	1.69E+02	1.76E+01 G
		43.00	-2.244E-08	%	6.964E-01	9.20E+08	1.31E+01 G
		873.20	-8.376E-03	%	5.096E-01	1.71E+03	1.13E+01 G
		996.30	4.533E-02	&(	4.373E-01	3.44E+02	1.07E+01 G
		42.31	-1.909E-01	+	1.287E+00	2.01E+02	7.30E+00 G
		248.04	1.809E-01	?(	1.168E+00	1.93E+02	6.60E+00 G
		591.70	1.806E-01	?(	1.189E+00	1.92E+02	4.60E+00 G
		48.70	3.371E-01	&(	1.780E+00	1.58E+02	4.20E+00 G
		756.70	-4.109E-01	+	1.360E+00	1.20E+02	4.10E+00 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

! - Peak is part of a multiplet and this area went negative during deconvolution.

? - Peak is too narrow.

@ - Peak is too wide at FW25M, but ok at FWHM.

% - Peak fails sensitivity test.

\$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

+ - Peak activity higher than counting uncertainty range.

- - Peak activity lower than counting uncertainty range.

= - Peak outside analysis energy range.

& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.

P - Peakbackground subtraction

} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:

T - Thermal Neutron Activation
 F - Fast Neutron Activation
 I - Fission Product
 N - Naturally Occurring Isotope
 P - Photon Reaction
 C - Charged Particle Reaction
 M - No MDA Calculation
 R - Coincidence Corrected
 H - Halflife limit exceeded

Peak Codes:

G - Gamma Ray
 X - X-Ray
 P - Positron Decay
 S - Single-Escape
 D - Double-Escape
 K - Key Line
 A - Not in Average
 C - Coincidence Peak

***** D I S C A R D E D I S O T O P E P E A K S *****

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
EU-154	42.31	634.	-18.	-0.005	402.81	-1.909E-01
PB-210	46.52	669.	-31.	-0.009	237.38	-5.508E-01 P
EU-154	48.70	524.	21.	0.006	315.55	3.371E-01
Am-241	59.54	504.	14.	0.004	473.26	2.074E-02
PA-234	94.67	672.	23.	0.007	318.01	6.305E-02 P
PA-234	98.44	731.	-29.	-0.008	259.62	-4.797E-02 P

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 11:29:28 AM
 AAA Spectrum name: ARS03248.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
PA-234	99.70	757.	-29.	-0.008	264.02	-2.542E-01	P
PA-234	111.00	221.	-16.	-0.004	494.46	-7.575E-02	P
EU-154	123.10	192.	20.	0.006	197.99	2.134E-02	
PA-234	131.28	226.	-11.	-0.003	434.16	-2.299E-02	
U-235	143.76	317.	-23.	-0.007	218.77	-1.005E-01	
U-235	163.35	211.	-15.	-0.004	318.65	-1.495E-01	
U-235	205.31	326.	-24.	-0.007	221.16	-2.787E-01	
PA-234	226.87	146.	4.	0.001	1078.71	3.324E-02	P
EU-154	248.04	641.	19.	0.005	385.81	1.809E-01	
PA-234	569.26	31.	10.	0.003	200.11	1.159E-01	P
EU-154	591.70	84.	7.	0.002	383.55	1.806E-01	
CS-137	661.66	42.	2.	0.001	1112.65	3.054E-03	
PA-234	699.10	57.	-9.	-0.002	293.38	-2.644E-01	
EU-154	723.30	120.	-14.	-0.004	226.58	-9.898E-02	
PA-234	733.00	82.	13.	0.004	204.51	2.141E-01	
EU-154	756.70	61.	-12.	-0.003	239.86	-4.109E-01	
PA-234	831.10	26.	6.	0.002	289.40	1.741E-01	
PA-234	880.51	26.	10.	0.003	152.77	2.541E-01	
PA-234	883.24	49.	-5.	-0.001	397.99	-6.769E-02	
PA-234	898.60	26.	-2.	-0.001	626.08	-8.450E-02	P
PA-234	926.70	26.	8.	0.002	223.05	1.256E-01	
PA-234	946.00	46.	-12.	-0.003	169.97	-1.002E-01	
PA-234	949.00	51.	7.	0.002	298.86	1.524E-01	P
EU-154	996.30	27.	3.	0.001	687.20	4.533E-02	
EU-154	1004.80	27.	6.	0.002	337.09	5.743E-02	
CO-60	1173.24	22.	17.	0.005	110.85	3.402E-02	
EU-154	1274.80	36.	-3.	-0.001	757.19	-1.759E-02	
CO-60	1332.50	47.	-19.	-0.005	144.52	-4.029E-02	
PA-234	1394.10	0.	11.	0.003	70.85	6.027E-01	P
K-40	1460.75	481.	-24.	-0.007	55.70	-5.208E-01	P

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count	Uncertainty	2 Sigma	MDA
	Activity	Counting	Total	
	pCi/g	pCi/g	pCi/g	pCi/g
U-235 #A	-1.0053E-01	2.1992E-01	2.2003E-01	0.367E+00
RA-226 #A	6.9010E-01	5.5778E-01	5.5950E-01	0.808E+00
Ra-228	3.3683E-01	1.0771E-01	1.0979E-01	0.191E+00
Am-241 #A	2.0741E-02	9.8160E-02	9.8169E-02	0.165E+00
PB-210 #A	-5.5076E-01	1.3074E+00	1.3085E+00	0.221E+01
U-238 A	2.3556E-01	5.7653E-01	5.7681E-01	0.905E+00
K-40 #A	-5.2081E-01	2.9010E-01	2.9202E-01	0.227E+01
PB-214	3.7797E-01	6.9959E-02	7.7213E-02	0.972E-01
BI-214	3.5392E-01	8.4844E-02	8.7456E-02	0.891E-01
BI-212 #	3.1542E-01	1.9559E-01	1.9660E-01	0.231E+00

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 11:29:28 AM
 AAA Spectrum name: ARS03248.An1

PB-212	3.7230E-01	6.1375E-02	6.7562E-02	0.694E-01
TL-208	1.0664E-01	3.2635E-02	3.3320E-02	0.354E-01
PA-234 #A	1.0478E-01	7.4237E-02	7.4639E-02	0.213E+00
CS-137 #A	3.0535E-03	3.3975E-02	3.3976E-02	0.502E-01
CO-60 #A	3.4021E-02	3.7711E-02	3.7732E-02	0.476E-01
EU-152 A	2.0655E-02	6.6707E-02	6.6747E-02	0.115E+00
EU-154 #A	6.8908E-02	1.1602E-01	1.1612E-01	0.707E-01

- All peaks for activity calculation had bad shape.
 * - Activity omitted from total
 & - Activity omitted from total and all peaks had bad shape.
 < - MDA value printed.
 A - Activity printed, but activity < MDA.
 B - Activity < MDA and failed test.
 C - Area < Critical level.
 F - Failed fraction or key line test.
 H - Halflife limit exceeded


----- S U M M A R Y -----
 Total Activity (2.8 to 1997.0 keV) 2.553E+00 pCi/g

The library has energies which are not separable.

Analyzed by: _____
 Countroom

Reviewed by: _____
 Supervisor

Laboratory: AAA

 Ortec Gamma		Batch Sample ID	ARS1-B23-01775-08		
		Analytical Batch	ARS1-B23-01775	Analysis Date	9/29/2023 11:33
		Analysis Code	GAM-IG21-SO	SDG	ARS1-23-01973
		Detector	ARS06 MCB 133	Fraction	005
		Count Time (sec)	3600	Run	1
		Library	ITSI COUNT.Lib		
		Geometry	2275-19-5 250mL tc poly		
Isotope	Activity	Units	CSU	MDA	DL
Am-241	8.3131E-002	pCi/g	5.9530E-002	8.7200E-002	4.3600E-002
Bi-212	2.5692E-001	pCi/g	2.9806E-001	5.1400E-001	2.5700E-001
Bi-214	3.6471E-001	pCi/g	8.1120E-002	7.3200E-002	3.6600E-002
Co-60	-3.2566E-002	pCi/g	5.0624E-002	6.1400E-002	3.0700E-002
Cs-137	-4.9910E-003	pCi/g	3.2024E-002	4.3600E-002	2.1800E-002
Eu-152	1.6428E-002	pCi/g	2.7112E-002	5.1500E-001	2.5750E-001
Eu-154	4.4776E-002	pCi/g	8.5812E-002	6.6100E-002	3.3050E-002
K-40	1.0382E+001	pCi/g	1.0524E+000	1.1800E-001	5.9000E-002
Pa-234	1.2562E-001	pCi/g	1.0489E-001	7.0900E-002	3.5450E-002
Pb-210	9.4688E-001	pCi/g	6.4556E-001	1.0200E+000	5.1000E-001
Pb-212	4.0192E-001	pCi/g	5.7387E-002	4.9500E-002	2.4750E-002
Pb-214	4.0326E-001	pCi/g	6.9882E-002	6.4300E-002	3.2150E-002
Ra-226	7.6112E-001	pCi/g	3.7310E-001	5.6200E-001	2.8100E-001
Ra-228	3.5345E-001	pCi/g	9.4172E-002	9.8400E-002	4.9200E-002
Tl-208	1.2562E-001	pCi/g	3.3736E-002	3.1900E-002	1.5950E-002
U-235	7.7446E-002	pCi/g	1.6060E-001	2.6000E-001	1.3000E-001
U-238	-3.7921E-001	pCi/g	8.4799E-001	1.4100E+000	7.0500E-001

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 12:33:13 PM
 AAA Spectrum name: ARS06053.An1

Sample description

Batch ID: 23-01775-08
 SDG ID: ARS1-23-01973-005 Tech: SDW

Spectrum Filename: C:\User\ARS06053.An1

Acquisition information

Start time: 9/29/2023 11:33:04 AM
 Live time: 3600
 Real time: 3603
 Dead time: 0.09 %
 Detector ID: 21

Detector system

ARS06 MCB 133

Calibration

Filename: 2275-19-5 250mL tc poly cal 12-8-21.Clb
 2275-19-5 250mL tc poly
 12-8-21 EEC

Energy Calibration

Created: 12/8/2021 10:48:48 AM
 Zero offset: 0.100 keV
 Gain: 0.250 keV/channel
 Quadratic: -3.095E-08 keV/channel^2

Efficiency Calibration

Created: 12/8/2021 11:58:07 AM
 Type: Polynomial
 Uncertainty: 1.254 %
 Coefficients: -0.502841 -4.041766 0.314910
 -0.026798 0.000803 -0.000009

Library Files

Main analysis library: ITSI COUNT.Lib
 Library Match Width: 0.500
 Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G800W064
 Start channel: 10 (2.60keV)
 Stop channel: 8000 (1998.39keV)
 Peak rejection level: 1000.000%
 Peak search sensitivity: 1
 Sample Size: 4.2471E+02 +/- 0.000E+00%
 Activity scaling factor: 1.0000E+06/(1.0000E+00* 4.2471E+02) =
 2.3545E+03
 Detection limit method: Reg. Guide 4.16 Method
 Random error: 1.0000000E+00
 Systematic error: 1.0000000E+00
 Fraction Limit: 0.000%
 Background width: 5
 Half lives decay limit: 12.000

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 12:33:13 PM
 AAA Spectrum name: ARS06053.An1

Activity range factor: 2.000
 Min. step backg. energy 0.000
 Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	NO	
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	ITSI.Pbc 9/21/2023 8:04:04 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 0 cutoff: 0.00E+00 %
 Energy Calibration
 Normalized diff: 0.1833

***** S U M M A R Y O F P E A K S I N R A N G E *****								
Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
12.35	176.	13.33	1.30	1.514E-03				
20.67	18.	91.84	0.44	8.216E-03				
30.02	54.	42.15	1.10	1.568E-02				
37.75	85.	27.31	0.98	2.198E-02				
41.72	176.	18.52	0.98	2.514E-02	42.31	7.300	1.671E+00	EU154
42.72	155.	19.07	0.98	2.594E-02	42.31	7.300	1.476E+00	EU154
					43.00	13.100	8.049E-01	EU154
44.39	28.	82.23	0.99	2.727E-02				
46.68	66.	30.68	0.99	2.900E-02	46.52	4.000	1.018E+00	PB210
48.70	37.	155.17	0.99	3.063E-02	48.70	4.200	PBC<MDA	EU154
53.53	53.	50.75	0.26	3.483E-02				
59.71	67.	35.67	0.45	3.982E-02	59.54	35.900	8.313E-02	Am241
71.56	36.	50.66	1.02	4.738E-02				
74.83	162.	15.27	1.02	4.896E-02				
77.11	254.	10.42	1.02	4.992E-02				
84.21	39.	46.04	1.03	5.228E-02				
87.44	86.	22.47	1.04	5.306E-02				
89.68	67.	27.88	1.04	5.350E-02				
92.88	82.	24.16	1.04	5.400E-02	92.38	2.570	1.040E+00	U238
					92.80	3.000	8.902E-01	U238
98.92	30.	65.93	1.82	5.461E-02	98.44	25.100	3.807E-02	PA234
					99.70	4.700	2.030E-01	PA234
111.00	7.	380.59	1.06	5.471E-02	111.00	8.550	PBC<MDA	PA234
123.10	12.	194.75	1.08	5.386E-02	123.10	40.460	PBC<MDA	EU154
143.76	7.	395.86	1.10	5.129E-02	143.76	10.500	PBC<MDA	U235
163.35	26.	103.63	1.12	4.839E-02	163.35	4.700	PBC<MDA	U235
167.93	8.	153.09	0.20	4.771E-02				

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 12:33:13 PM
 AAA Spectrum name: ARS06053.An1

pk	energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
185.97	71.	24.38	1.15	4.508E-02	186.21	3.640	7.600E-01	RA226	
190.25	8.	194.96	1.15	4.448E-02					
191.94	15.	112.71	1.16	4.425E-02					
205.65	6.	176.81	0.39	4.242E-02	205.31	4.700	5.137E-02	U235	
232.64	16.	95.69	0.32	3.919E-02					
238.47	338.	7.73	1.17	3.855E-02	238.63	43.100	3.600E-01	PB212	
241.85	67.	24.64	1.21	3.817E-02	241.98	7.500	4.139E-01	PB214	
263.57	24.	50.94	0.76	3.604E-02					
277.33	31.	38.02	1.25	3.481E-02	277.36	6.500	2.423E-01	TL208	
282.18	21.	53.11	1.26	3.440E-02					
294.96	126.	12.94	1.27	3.336E-02	295.21	18.500	3.600E-01	PB214	
300.34	40.	31.54	1.28	3.295E-02	300.09	3.270	6.610E-01	PB212	
338.31	86.	22.29	0.54	3.035E-02	338.40	12.010	4.167E-01	Ra228	
344.30	19.	157.25	1.33	2.998E-02	344.30	27.000	PBC<MDA	EU152	
349.25	9.	133.01	1.33	2.968E-02					
351.80	253.	7.56	1.33	2.953E-02	351.92	35.800	4.234E-01	PB214	
511.09	188.	11.30	2.55	2.284E-02	510.72	22.500	6.450E-01	TL208	
583.20	128.	13.06	0.82	2.086E-02	583.14	86.000	1.256E-01	TL208	
609.47	191.	10.72	1.61	2.024E-02	609.31	44.791	3.728E-01	BI214	
621.91	5.	100.00	0.66	1.996E-02					
727.29	39.	21.72	1.22	1.790E-02	727.17	11.800	3.281E-01	BI212	
733.04	15.	123.51	1.73	1.780E-02	733.00	8.500	PBC<MDA	PA234	
778.90	10.	106.03	1.77	1.705E-02	778.90	12.990	PBC<MDA	EU152	
784.65	16.	83.19	1.78	1.695E-02	785.42	2.000	PBC<MDA	BI212	
866.10	1.	319.12	1.86	1.579E-02	867.39	4.176	1.878E-02	EU152	
883.24	18.	108.91	1.87	1.557E-02	883.24	12.000	PBC<MDA	PA234	
898.60	27.	41.59	1.89	1.537E-02	898.60	4.000	PBC<MDA	PA234	
911.50	82.	15.05	1.87	1.521E-02	911.07	29.000	3.285E-01	Ra228	
934.06	16.	79.94	1.92	1.493E-02	934.06	3.029	PBC<MDA	BI214	
964.00	14.	126.25	1.95	1.458E-02	964.00	14.580	PBC<MDA	EU152	
					964.60	5.452	3.003E-01	Ra228	
969.49	57.	21.03	1.95	1.452E-02	968.90	17.460	3.944E-01	Ra228	
1085.80	4.	300.62	2.06	1.330E-02	1085.80	10.290	PBC<MDA	EU152	
1120.20	59.	14.68	2.49	1.298E-02	1120.29	14.797	5.451E-01	BI214	
1207.46	32.	25.22	0.80	1.220E-02					
1238.27	12.	150.00	2.19	1.195E-02	1238.11	5.859	PBC<MDA	BI214	
1274.80	7.	143.29	2.22	1.166E-02	1274.80	35.500	PBC<MDA	EU154	
1332.50	9.	93.89	2.27	1.122E-02	1332.50	99.982	PBC<MDA	CO60	
1461.04	649.	3.93	1.94	1.032E-02	1460.75	10.700	1.038E+01	K40	
1508.51	20.	22.36	2.37	1.002E-02					
1618.27	7.	75.37	2.49	9.350E-03	1620.56	2.750	PBC<MDA	BI212	
1764.77	34.	17.15	1.83	8.573E-03	1764.49	15.357	3.806E-01	BI214	

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 12:33:13 PM
 AAA Spectrum name: ARS06053.An1

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***** U N I D E N T I F I E D      P E A K      S U M M A R Y *****
Peak Centroid Background Net Area Efficiency Uncert FWHM Suspected
Channel Energy Counts Counts * Area 2 Sigma % keV Nuclide

48.99 12.26 144. 176. 1.162E+05 26.66 1.302 - s
82.25 20.67 136. 18. 2.203E+03 183.67 0.436 - sc
119.68 30.02 200. 54. 3.431E+03 84.30 1.101 -
150.76 37.92 229. 85. 3.879E+03 54.65 0.977 - sD
166.61 41.89 428. 181. 7.186E+03 35.63 0.982 - sD
170.63 42.89 369. 149. 5.759E+03 39.90 0.983 - sD
177.31 44.56 259. 29. 1.061E+03 161.69 0.985 - sc
213.68 53.53 294. 53. 1.528E+03 101.50 0.261 - s
285.80 71.56 144. 36. 7.504E+02 101.32 1.017 - sD
298.90 74.83 226. 162. 3.314E+03 30.54 1.021 - sD
308.02 77.11 224. 254. 5.097E+03 20.83 1.024 - sD
336.44 84.23 143. 39. 7.443E+02 92.67 1.032 - sD
349.38 87.47 149. 83. 1.564E+03 47.06 1.036 - sD
358.31 89.70 139. 67. 1.248E+03 55.62 1.038 - sD
371.13 92.91 160. 75. 1.394E+03 52.78 1.042 - sD
671.27 167.93 71. 8. 1.677E+02 306.19 0.196 - sc
760.58 190.29 105. 8. 0.000E+00 389.91 1.154 - lc
766.33 191.97 120. 14. 3.061E+02 235.52 1.156 - lc
822.16 205.65 55. 6. 1.367E+02 353.61 0.395 - lc
930.12 232.64 91. 16. 4.083E+02 191.38 0.317 - lc
1053.86 263.57 52. 24. 6.799E+02 101.88 0.755 - sM
1108.94 277.31 54. 31. 8.908E+02 76.05 1.252 - sD
1128.33 282.16 49. 21. 5.983E+02 106.21 1.258 - sD
1396.39 349.30 73. 9. 3.032E+02 276.71 1.331 - sc
2487.67 621.91 10. 5. 2.505E+02 200.00 0.656 - sc
3464.76 866.10 17. 2. 1.524E+02 498.47 1.858 - sc
4831.68 1207.46 8. 32. 2.589E+03 50.44 0.796 - s
6037.33 1508.51 0. 20. 1.996E+03 44.72 2.372 - s
```

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 L - Peak written from unknown list.
 C - Area < Critical level.
 M - Peak is close to a library peak.

 This section based on library: ITSI COUNT.Lib

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 12:33:13 PM
 AAA Spectrum name: ARS06053.An1

***** I D E N T I F I E D P E A K S U M M A R Y *****

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma	FWHM % keV
EU-152	157.66	39.52	1968.	-38.	-0.011	333.05	0.980s
EU-152	160.06	40.12	1931.	-38.	-0.011	329.66	0.980s
EU-154	168.82	42.31	1893.	-38.	-0.011	325.56	0.983s
EU-154	171.58	43.00	1855.	-38.	-0.011	322.02	0.984s
EU-152	181.18	45.40	1817.	-38.	-0.011	317.89	0.986s
PB-210	185.66	46.52	185.	62.	0.017	67.48	0.988D
EU-154	194.38	48.70	1608.	37.	0.010	310.34	0.990s
Am-241	238.42	59.71	210.	67.	0.019	71.33	0.451s
U-238	252.73	63.29	768.	-35.	-0.010	223.48	1.008s
U-238	369.09	92.38	921.	18.	0.005	482.33	1.041s
U-238	370.77	92.80	939.	0.	0.000	2000.00	1.042s
PA-234	378.24	94.67	1271.	-30.	-0.008	334.99	1.044
PA-234	393.32	98.44	125.	14.	0.004	235.77	1.048D
PA-234	398.36	99.70	1203.	-8.	-0.002	1272.32	1.050
PA-234	443.56	111.00	265.	7.	0.002	761.19	1.063
EU-152	486.68	121.78	353.	-6.	-0.002	834.56	1.076s
EU-154	491.96	123.10	285.	12.	0.003	389.51	1.077
PA-234	524.68	131.28	270.	-12.	-0.003	423.18	1.087s
U-235	574.60	143.76	270.	7.	0.002	791.72	1.101s
U-235	652.96	163.35	350.	26.	0.007	207.26	1.123s
RA-226	744.41	186.21	112.	71.	0.020	48.68	1.149D
U-235	820.81	205.31	249.	-6.	-0.002	702.39	1.171s
PA-234	907.06	226.87	260.	-31.	-0.009	174.51	1.196s
PB-212	954.10	238.63	88.	378.	0.105	12.47	1.209D
PB-214	967.51	241.98	103.	67.	0.019	49.29	1.212D
EU-152	978.26	244.67	935.	-27.	-0.008	318.00	1.216
EU-154	991.75	248.04	906.	-28.	-0.008	305.78	1.219
TL-208	1109.04	277.36	254.	-22.	-0.006	205.89	1.252
PB-214	1180.46	295.21	69.	126.	0.035	25.89	1.272D
PB-212	1199.97	300.09	56.	40.	0.011	61.70	1.277D
Ra-228	1353.24	338.40	129.	73.	0.020	57.93	1.320s
EU-152	1376.85	344.30	448.	19.	0.005	314.51	1.326s
PB-214	1407.34	351.92	59.	253.	0.070	15.21	1.334D
TL-208	2044.22	511.09	50.	188.	0.052	22.61	2.552
PA-234	2276.97	569.26	74.	-4.	-0.001	845.76	1.565s
TL-208	2332.76	583.20	40.	128.	0.035	26.12	0.817s
EU-154	2366.77	591.70	58.	-5.	-0.001	588.42	1.588s
BI-214	2437.87	609.47	56.	191.	0.053	21.44	1.614
CS-137	2646.75	661.66	65.	-5.	-0.001	641.62	1.659s
PA-234	2796.59	699.10	75.	-6.	-0.002	548.09	1.696s
EU-154	2893.44	723.30	196.	-21.	-0.006	191.38	1.720s
BI-212	2908.93	727.17	159.	14.	0.004	265.28	1.724s
PA-234	2932.26	733.00	154.	15.	0.004	247.02	1.730s
EU-154	3027.12	756.70	183.	-22.	-0.006	181.77	1.753s

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 12:33:13 PM
 AAA Spectrum name: ARS06053.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
BI-214	3073.77	768.36	92.	-19.	-0.005	188.40	1.764
EU-152	3115.98	778.90	56.	10.	0.003	212.06	1.775s
BI-212	3142.07	785.42	76.	16.	0.004	166.37	1.781s
PA-234	3324.91	831.10	68.	-14.	-0.004	221.27	1.825
TL-208	3442.48	860.47	149.	-2.	-0.001	1570.78	1.853s
EU-152	3470.18	867.39	147.	0.	0.000	2000.00	1.859s
EU-154	3493.43	873.20	147.	0.	0.000	2000.00	1.865s
PA-234	3522.70	880.51	211.	-21.	-0.006	196.70	1.872s
PA-234	3533.62	883.24	188.	18.	0.005	217.81	1.874
PA-234	3595.11	898.60	29.	27.	0.008	83.19	1.889
Ra-228	3646.73	911.50	22.	82.	0.023	30.11	1.872
PA-234	3707.60	926.70	83.	-13.	-0.003	212.91	1.915s
BI-214	3737.06	934.06	78.	16.	0.005	159.88	1.922s
PA-234	3784.86	946.00	66.	-18.	-0.005	136.08	1.933s
PA-234	3796.87	949.00	100.	-9.	-0.002	335.24	1.936s
EU-152	3856.92	964.00	138.	14.	0.004	252.50	1.949s
Ra-228	3859.32	964.60	152.	0.	0.000	2000.00	1.950
Ra-228	3878.89	969.49	22.	57.	0.016	42.07	1.953
EU-154	4020.25	1004.80	53.	-6.	-0.002	459.65	1.987s
EU-152	4344.54	1085.80	38.	4.	0.001	601.25	2.059
EU-152	4449.72	1112.07	165.	-22.	-0.006	167.14	2.082s
BI-214	4482.29	1120.20	5.	59.	0.016	29.36	2.489
CO-60	4694.64	1173.24	76.	-23.	-0.006	155.41	2.135s
BI-214	4954.40	1238.11	80.	12.	0.003	300.00	2.190
EU-154	5101.33	1274.80	24.	7.	0.002	286.57	2.221s
CO-60	5332.40	1332.50	16.	9.	0.002	187.77	2.268s
BI-214	5513.29	1377.67	42.	0.	0.000	2000.00	2.305s
PA-234	5579.09	1394.10	42.	-15.	-0.004	182.43	2.318s
EU-152	5635.08	1408.08	42.	-9.	-0.002	299.13	2.329
K-40	5847.19	1461.04	0.	649.	0.180	7.85	1.942
BI-212	6486.16	1620.56	4.	7.	0.002	150.74	2.491s
BI-214	7062.79	1764.49	19.	18.	0.005	109.31	2.594s

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Average Code Activity pCi/g	Energy keV	Activity pCi/g	Code MDA Value pCi/g	COMMENTS
U-235	7.7446E-02			1.39E+09	
		143.76	2.166E-02	@(2.604E-01 3.96E+02 1.05E+01 G	
		205.31	-5.668E-02	+ 6.758E-01 3.51E+02 4.70E+00 G	
		163.35	2.021E-01	?(6.986E-01 1.04E+02 4.70E+00 G	

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 12:33:13 PM
 AAA Spectrum name: ARS06053.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
RA-226	7.6112E-01					5.84E+05	
		186.21	7.611E-01	(	5.618E-01	2.43E+01	3.64E+00 G K
Ra-228	3.5345E-01					2.10E+03	
		911.07	3.285E-01	(	9.842E-02	1.51E+01	2.90E+01 G
		968.90	3.944E-01	(	1.726E-01	2.10E+01	1.75E+01 G
		338.40	3.541E-01	?(	2.699E-01	2.90E+01	1.20E+01 G
		964.60	0.000E+00	-	1.338E+00	1.00E+03	5.45E+00 G
Am-241	T 8.3131E-02					1.58E+05	
		59.54	8.313E-02	(	8.715E-02	3.57E+01	3.59E+01 G K
PB-210	9.4688E-01					7.45E+03	
		46.52	9.469E-01	(	1.016E+00	3.37E+01	4.00E+00 G
U-238	-3.7921E-01					1.63E+12	
		63.29	-3.792E-01	?(	1.409E+00	1.12E+02	3.90E+00 G
		92.80	0.000E+00	+	1.588E+00	1.00E+03	3.00E+00 G
		92.38	2.281E-01	+	1.838E+00	2.41E+02	2.57E+00 G
K-40	1.0382E+01					4.68E+11	
		1460.75	1.038E+01	(	1.179E-01	3.93E+00	1.07E+01 G
PB-214	4.0326E-01					5.84E+05	
		351.92	4.234E-01	(	6.428E-02	7.60E+00	3.58E+01 G
		295.21	3.599E-01	(	1.190E-01	1.29E+01	1.85E+01 G
		241.98	4.139E-01	(	3.087E-01	2.46E+01	7.50E+00 G
BI-214	3.6471E-01					5.84E+05	
		609.31	3.728E-01	(	7.315E-02	1.07E+01	4.48E+01 G
		1764.49	2.356E-01	- P	3.123E-01	5.47E+01	1.54E+01 G
		1120.29	5.451E-01	+	1.190E-01	1.47E+01	1.48E+01 G
		1238.11	3.030E-01	?(	1.121E+00	1.50E+02	5.86E+00 G
		768.36	-4.090E-01	-	1.017E+00	9.42E+01	4.80E+00 G
		1377.67	0.000E+00	-	1.363E+00	1.00E+03	3.92E+00 G
		934.06	6.400E-01	&	1.709E+00	7.99E+01	3.03E+00 G
BI-212	2.5692E-01					2.10E+03	
		727.17	1.148E-01	?(	5.140E-01	1.33E+02	1.18E+01 G
		1620.56	4.618E-01	&(	8.583E-01	7.54E+01	2.75E+00 G
		785.42	8.135E-01	?(	2.265E+00	8.32E+01	2.00E+00 G
PB-212	4.0192E-01					2.10E+03	
		238.63	4.019E-01	(	4.952E-02	6.24E+00	4.31E+01 G
		300.09	6.554E-01	+	6.164E-01	3.08E+01	3.27E+00 G

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 12:33:13 PM
 AAA Spectrum name: ARS06053.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
TL-208	1.2562E-01					2.10E+03	
		583.14	1.256E-01	(	3.189E-02	1.31E+01	8.60E+01 G
		510.72	6.450E-01	+	1.231E-01	1.13E+01	2.25E+01 G
		860.47	-2.049E-02	-	5.536E-01	7.85E+02	1.20E+01 G
		277.36	-1.748E-01	-	6.015E-01	1.03E+02	6.50E+00 G
		763.30	-4.104E-02	&	3.743E+00	2.65E+03	1.70E+00 G
PA-234	1.2562E-01					1.65E+12	
		98.44	1.781E-02	(	7.087E-02	1.18E+02	2.51E+01 G
		946.00	-1.075E-01	+	2.424E-01	6.80E+01	2.00E+01 G
		131.28	-2.070E-02	&	1.324E-01	2.12E+02	2.00E+01 G
		94.67	-6.369E-02	&	3.551E-01	1.67E+02	1.55E+01 G
		883.24	1.723E-01	(	6.296E-01	1.09E+02	1.20E+01 G
		926.70	-1.339E-01	+	4.818E-01	1.06E+02	1.10E+01 G
		569.26	-2.885E-02	-	3.421E-01	4.23E+02	1.04E+01 G
		111.00	2.569E-02	(	2.970E-01	3.81E+02	8.55E+00 G
		733.00	1.696E-01	?(	7.063E-01	1.24E+02	8.50E+00 G
		949.00	-1.321E-01	+	7.558E-01	1.68E+02	7.80E+00 G
		880.51	-3.730E-01	+	1.226E+00	9.83E+01	6.50E+00 G
		226.87	-2.120E-01	+	5.319E-01	8.73E+01	6.50E+00 G
		831.10	-2.793E-01	+	8.001E-01	1.11E+02	5.60E+00 G
		808.10	-4.345E-03	%	7.242E-01	6.15E+03	4.90E+00 G
		99.70	-5.315E-02	-	1.131E+00	6.36E+02	4.70E+00 G
		699.10	-1.211E-01	+	8.983E-01	2.74E+02	4.60E+00 G
		898.60	7.820E-01	(	7.969E-01	4.16E+01	4.00E+00 G
		1394.10	-6.309E-01	+	1.384E+00	9.12E+01	3.90E+00 G
CS-137	-4.9910E-03					1.10E+04	
		661.66	-4.991E-03	?(	4.358E-02	3.21E+02	8.52E+01 G
CO-60	-3.2566E-02					1.93E+03	
		1173.24	-3.257E-02	&(	6.136E-02	7.77E+01	9.99E+01 K
		1332.50	1.418E-02	&	3.365E-02	9.39E+01	1.00E+02 K
EU-152	1.6428E-02					4.64E+03	
		40.12	-9.406E-02	?(	5.151E-01	1.65E+02	3.00E+01 G
		121.78	-7.166E-03	+	1.011E-01	4.17E+02	2.92E+01 G
		344.30	4.200E-02	?(	2.213E-01	1.57E+02	2.70E+01 G
		1408.08	-7.023E-02	+	2.568E-01	1.50E+02	2.12E+01 G
		39.52	-1.799E-01	+	9.952E-01	1.67E+02	1.60E+01 G
		964.00	1.122E-01	&(	4.784E-01	1.26E+02	1.46E+01 G
		1112.07	-2.239E-01	+	6.237E-01	8.36E+01	1.36E+01 G
		778.90	8.301E-02	?(	2.990E-01	1.06E+02	1.30E+01 G
		1085.80	5.166E-02	?(	4.060E-01	3.01E+02	1.03E+01 G
		45.40	-2.680E-01	+	1.415E+00	1.59E+02	9.00E+00 G
		244.67	-1.678E-01	+	8.892E-01	1.59E+02	7.62E+00 G
		867.39	0.000E+00	-	1.589E+00	1.00E+03	4.18E+00 G

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 12:33:13 PM
 AAA Spectrum name: ARS06053.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
EU-154	4.4776E-02					3.10E+03	
		123.10	1.006E-02	&(	6.605E-02	1.95E+02	4.05E+01 G
		1274.80	2.990E-02	? (	1.091E-01	1.43E+02	3.55E+01 G
		723.30	-1.061E-01	&	3.393E-01	9.57E+01	1.97E+01 G
		1004.80	-4.407E-02	+	2.608E-01	2.30E+02	1.76E+01 G
		43.00	-1.971E-01	+	1.054E+00	1.61E+02	1.31E+01 G
		873.20	0.000E+00	-	5.900E-01	1.00E+03	1.13E+01 G
		996.30	-2.323E-03	%	4.263E-01	7.02E+03	1.07E+01 G
		42.31	-3.610E-01	+	1.953E+00	1.63E+02	7.30E+00 G
		248.04	-2.002E-01	&	1.020E+00	1.53E+02	6.60E+00 G
		591.70	-8.558E-02	+	7.084E-01	2.94E+02	4.60E+00 G
		48.70	5.050E-01	? (	2.604E+00	1.55E+02	4.20E+00 G
		756.70	-5.362E-01	&	1.627E+00	9.09E+01	4.10E+00 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

! - Peak is part of a multiplet and this area went negative during deconvolution.

? - Peak is too narrow.

@ - Peak is too wide at FW25M, but ok at FWHM.

% - Peak fails sensitivity test.

\$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

+ - Peak activity higher than counting uncertainty range.

- - Peak activity lower than counting uncertainty range.

= - Peak outside analysis energy range.

& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.

P - Peakbackground subtraction

} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:

T - Thermal Neutron Activation
 F - Fast Neutron Activation
 I - Fission Product
 N - Naturally Occurring Isotope
 P - Photon Reaction
 C - Charged Particle Reaction
 M - No MDA Calculation
 R - Coincidence Corrected
 H - Half-life limit exceeded

Peak Codes:

G - Gamma Ray
 X - X-Ray
 P - Positron Decay
 S - Single-Escape
 D - Double-Escape
 K - Key Line
 A - Not in Average
 C - Coincidence Peak

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 AAA Spectrum name: ARS06053.An1

***** D I S C A R D E D I S O T O P E P E A K S *****

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
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EU-152	39.52	1968.	-38.	-0.011	333.05	-1.799E-01
EU-152	40.12	1931.	-38.	-0.011	329.66	-9.406E-02
EU-154	42.31	1893.	-38.	-0.011	325.56	-3.610E-01
EU-154	43.00	1855.	-38.	-0.011	322.02	-1.971E-01
EU-152	45.40	1817.	-38.	-0.011	317.89	-2.680E-01
EU-154	48.70	1608.	37.	0.010	310.34	5.050E-01
U-238	63.29	768.	-35.	-0.010	223.48	-3.792E-01
U-238	92.38	921.	18.	0.005	482.33	2.281E-01
EU-152	121.78	353.	-6.	-0.002	834.56	-7.166E-03
EU-154	123.10	285.	12.	0.003	389.51	1.006E-02
U-235	143.76	270.	7.	0.002	791.72	2.166E-02
U-235	163.35	350.	26.	0.007	207.26	2.021E-01
U-235	205.31	249.	-6.	-0.002	702.39	-5.668E-02
EU-152	244.67	935.	-27.	-0.008	318.00	-1.678E-01
EU-154	248.04	906.	-28.	-0.008	305.78	-2.002E-01
EU-152	344.30	448.	19.	0.005	314.51	4.200E-02
EU-154	591.70	58.	-5.	-0.001	588.42	-8.558E-02
CS-137	661.66	65.	-5.	-0.001	641.62	-4.991E-03
EU-154	723.30	196.	-21.	-0.006	191.38	-1.061E-01
EU-154	756.70	183.	-22.	-0.006	181.77	-5.362E-01
EU-152	778.90	56.	10.	0.003	212.06	8.301E-02
EU-152	964.00	138.	14.	0.004	252.50	1.122E-01
EU-154	1004.80	53.	-6.	-0.002	459.65	-4.407E-02
EU-152	1085.80	38.	4.	0.001	601.25	5.166E-02
EU-152	1112.07	165.	-22.	-0.006	167.14	-2.239E-01
CO-60	1173.24	76.	-23.	-0.006	155.41	-3.257E-02
EU-154	1274.80	24.	7.	0.002	286.57	2.990E-02
CO-60	1332.50	16.	9.	0.002	187.77	1.418E-02
EU-152	1408.08	42.	-9.	-0.002	299.13	-7.023E-02

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count	Activity	Uncertainty	2 Sigma	MDA
		pCi/g	Counting	Total	pCi/g
			pCi/g	pCi/g	

U-235	#A	7.7446E-02	1.6052E-01	1.6060E-01	0.260E+00
RA-226	#	7.6112E-01	3.7055E-01	3.7310E-01	0.562E+00
Ra-228		3.5345E-01	9.1505E-02	9.4172E-02	0.984E-01
Am-241	A	8.3131E-02	5.9297E-02	5.9530E-02	0.872E-01
PB-210	A	9.4688E-01	6.3899E-01	6.4556E-01	0.102E+01
U-238	#A	-3.7921E-01	8.4749E-01	8.4799E-01	0.141E+01
K-40		1.0382E+01	8.1509E-01	1.0524E+00	0.118E+00

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 AAA Spectrum name: ARS06053.An1

PB-214	4.0326E-01	6.1334E-02	6.9882E-02	0.643E-01
BI-214	3.6471E-01	7.8181E-02	8.1120E-02	0.732E-01
BI-212 #A	2.5692E-01	2.9762E-01	2.9806E-01	0.514E+00
PB-212	4.0192E-01	5.0127E-02	5.7387E-02	0.495E-01
TL-208	1.2562E-01	3.2816E-02	3.3736E-02	0.319E-01
PA-234 C	1.2562E-01	1.0450E-01	1.0489E-01	0.709E-01
CS-137 #A	-4.9910E-03	3.2023E-02	3.2024E-02	0.436E-01
CO-60 #A	-3.2566E-02	5.0610E-02	5.0624E-02	0.614E-01
EU-152 #A	1.6428E-02	2.7050E-02	2.7112E-02	0.515E+00
EU-154 #A	4.4776E-02	8.5760E-02	8.5812E-02	0.661E-01


- All peaks for activity calculation had bad shape.
 * - Activity omitted from total
 & - Activity omitted from total and all peaks had bad shape.
 < - MDA value printed.
 A - Activity printed, but activity < MDA.
 B - Activity < MDA and failed test.
 C - Area < Critical level.
 F - Failed fraction or key line test.
 H - Half-life limit exceeded

----- S U M M A R Y -----
 Total Activity (2.6 to 1998.4 keV) 1.382E+01 pCi/g

Analyzed by: _____
 Countroom

Reviewed by: _____
 Supervisor

Laboratory: AAA

 Ortec Gamma		Batch Sample ID	ARS1-B23-01775-09		
		Analytical Batch	ARS1-B23-01775	Analysis Date	9/29/2023 12:43
		Analysis Code	GAM-IG21-SO	SDG	
		Detector	(ARS03) MCB 129	Fraction	
		Count Time (sec)	3600	Run	
		Library	ITSI COUNT.Lib		
		Geometry	250mL tuna can poly 1948-64-2		
Isotope	Activity	Units	CSU	MDA	DL
Am-241	1.6074E-002	pCi/g	9.7801E-002	1.6400E-001	8.2000E-002
Bi-212	3.6678E-002	pCi/g	9.7501E-002	6.7000E-001	3.3500E-001
Bi-214	4.0464E-001	pCi/g	1.0339E-001	9.6300E-002	4.8150E-002
Co-60	0.0000E+000	pCi/g	1.9329E-002	5.6000E-002	2.8000E-002
Cs-137	-1.7115E-002	pCi/g	3.6076E-002	5.1300E-002	2.5650E-002
Eu-152	5.1094E-002	pCi/g	6.1431E-002	3.1500E-001	1.5750E-001
Eu-154	4.0673E-002	pCi/g	6.9637E-002	8.0500E-002	4.0250E-002
K-40	9.7466E+000	pCi/g	1.1166E+000	4.3300E-001	2.1650E-001
Pa-234	7.4481E-002	pCi/g	1.1664E-001	1.2000E-001	6.0000E-002
Pb-210	6.8682E-001	pCi/g	6.8618E-001	1.0200E+000	5.1000E-001
Pb-212	3.1334E-001	pCi/g	6.3255E-002	7.1900E-002	3.5950E-002
Pb-214	4.4271E-001	pCi/g	1.0040E-001	8.8700E-002	4.4350E-002
Ra-226	6.9224E-001	pCi/g	4.9459E-001	7.6300E-001	3.8150E-001
Ra-228	4.6555E-001	pCi/g	1.1566E-001	1.1200E-001	5.6000E-002
Tl-208	1.4986E-001	pCi/g	4.5926E-002	4.6900E-002	2.3450E-002
U-235	6.7918E-003	pCi/g	2.4151E-001	4.0800E-001	2.0400E-001
U-238	-2.3737E-001	pCi/g	8.6601E-001	1.4600E+000	7.3000E-001

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 AAA Spectrum name: ARS03250.An1

Sample description

Batch ID: 23-01775-09
 SDG ID: ARS1-23-01973-005 DUP Tech: SDW

Spectrum Filename: C:\User\ARS03250.An1

Acquisition information

Start time: 9/29/2023 12:43:06 PM
 Live time: 3600
 Real time: 3603
 Dead time: 0.10 %
 Detector ID: 17

Detector system

(ARS03) MCB 129

Calibration

Filename: 1948-64-2 250mL tc poly cal 12-15-17.Clb
 250mL tuna can poly 1948-64-2
 12-15-17 EEC

Energy Calibration

Created: 12/15/2017 11:10:20 AM
 Zero offset: 0.253 keV
 Gain: 0.250 keV/channel
 Quadratic: -1.778E-08 keV/channel^2

Efficiency Calibration

Created: 12/15/2017 12:18:46 PM
 Type: Polynomial
 Uncertainty: 1.552 %
 Coefficients: -0.414479 -4.439273 0.364604
 -0.031228 0.000978 -0.000011

Library Files

Main analysis library: ITSI COUNT.Lib
 Library Match Width: 0.500
 Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G800W064
 Start channel: 10 (2.75keV)
 Stop channel: 8000 (1997.02keV)
 Peak rejection level: 1000.000%
 Peak search sensitivity: 1
 Sample Size: 4.2471E+02 +/- 0.000E+00%
 Activity scaling factor: 1.0000E+06/(1.0000E+00* 4.2471E+02) =
 2.3545E+03
 Detection limit method: Reg. Guide 4.16 Method
 Random error: 1.0000000E+00
 Systematic error: 1.0000000E+00
 Fraction Limit: 0.000%
 Background width: 5
 Half lives decay limit: 12.000

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Activity range factor: 2.000
 Min. step backg. energy 0.000
 Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	NO	
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	ITSI.Pbc 9/21/2023 8:26:46 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 0 cutoff: 0.00E+00 %
 Energy Calibration
 Normalized diff: 0.1720

***** S U M M A R Y O F P E A K S I N R A N G E *****								
Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
23.99	18.	78.57	0.34	1.393E-02				
46.70	93.	19.80	0.67	2.648E-02	46.52	4.000	PBC<MDA	PB210
48.70	16.	169.97	0.88	2.769E-02	48.70	4.200	PBC<MDA	EU154
57.76	12.	106.53	0.44	3.327E-02				
59.54	11.	304.20	0.89	3.431E-02	59.54	35.900	PBC<MDA	Am241
63.18	63.	33.51	0.53	3.632E-02	63.29	3.900	PBC<MDA	U238
67.91	6.	210.84	0.41	3.865E-02				
74.73	140.	16.37	0.90	4.139E-02				
77.25	156.	14.37	0.90	4.221E-02				
87.07	70.	26.59	0.91	4.451E-02				
89.91	50.	36.30	0.91	4.491E-02				
92.91	99.	19.90	0.92	4.524E-02	92.38	2.570	PBC<MDA	U238
					92.80	3.000	PBC<MDA	U238
105.70	28.	52.10	0.67	4.565E-02				
121.78	23.	107.84	0.94	4.465E-02	121.78	29.240	PBC<MDA	EU152
137.24	21.	66.80	0.95	4.286E-02				
139.14	10.	140.11	0.96	4.262E-02				
156.05	25.	55.81	0.29	4.033E-02				
185.94	86.	19.66	1.00	3.632E-02	186.21	3.640	PBC<MDA	RA226
188.62	25.	56.19	1.00	3.598E-02				
191.94	16.	80.79	1.00	3.557E-02				
209.22	33.	39.54	1.02	3.349E-02				
212.12	12.	98.08	1.02	3.317E-02				
222.82	8.	108.99	0.74	3.206E-02				
238.63	232.	9.22	0.84	3.050E-02	238.63	43.100	2.739E-01	PB212
241.97	54.	31.51	1.05	3.019E-02	241.98	7.500	4.208E-01	PB214
244.67	19.	194.21	1.05	2.995E-02	244.67	7.616	PBC<MDA	EU152

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pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
260.05	5.	166.30	0.24	2.860E-02				
277.59	20.	57.74	0.71	2.726E-02	277.36	6.500	PBC<MDA	TL208
295.20	152.	10.68	1.26	2.604E-02	295.21	18.500	5.065E-01	PB214
322.14	6.	92.63	0.34	2.439E-02				
338.29	85.	18.93	0.54	2.351E-02	338.40	12.010	5.159E-01	Ra228
344.30	16.	87.03	1.13	2.321E-02	344.30	27.000	PBC<MDA	EU152
351.87	208.	8.86	0.84	2.284E-02	351.92	35.800	3.989E-01	PB214
358.08	9.	70.64	0.50	2.254E-02				
379.92	20.	44.99	1.45	2.158E-02				
421.52	8.	80.45	0.26	2.000E-02				
483.75	7.	75.65	0.46	1.811E-02				
510.82	175.	11.89	1.28	1.743E-02	510.72	22.500	7.888E-01	TL208
520.20	9.	60.78	0.48	1.720E-02				
552.01	21.	45.51	0.35	1.650E-02				
569.26	7.	172.65	1.32	1.615E-02	569.26	10.400	PBC<MDA	PA234
583.26	125.	13.50	1.22	1.588E-02	583.14	86.000	1.493E-01	TL208
591.70	15.	85.54	1.34	1.572E-02	591.70	4.600	PBC<MDA	EU154
609.47	167.	10.76	0.89	1.540E-02	609.31	44.791	3.844E-01	BI214
671.06	2.	223.61	0.20	1.440E-02				
733.00	3.	639.89	1.46	1.355E-02	733.00	8.500	PBC<MDA	PA234
756.32	15.	35.40	0.47	1.326E-02	756.70	4.100	4.879E-01	EU154
766.84	6.	257.32	1.49	1.312E-02	768.36	4.799	PBC<MDA	BI214
808.10	2.	585.10	1.52	1.266E-02	808.10	4.900	PBC<MDA	PA234
831.10	6.	181.79	1.54	1.242E-02	831.10	5.600	PBC<MDA	PA234
860.13	31.	29.49	0.35	1.212E-02	860.47	12.000	3.719E-01	TL208
867.39	10.	85.17	1.56	1.205E-02	867.39	4.176	PBC<MDA	EU152
880.51	1.	943.40	1.58	1.193E-02	880.51	6.500	PBC<MDA	PA234
898.60	5.	192.52	1.59	1.176E-02	898.60	4.000	PBC<MDA	PA234
911.52	90.	12.36	0.80	1.164E-02	911.07	29.000	4.447E-01	Ra228
926.70	12.	78.22	1.61	1.150E-02	926.70	11.000	PBC<MDA	PA234
933.78	22.	31.23	0.31	1.144E-02	934.06	3.029	1.122E+00	BI214
946.00	10.	100.05	1.63	1.134E-02	946.00	20.000	PBC<MDA	PA234
949.00	9.	110.44	1.63	1.131E-02	949.00	7.800	PBC<MDA	PA234
965.47	35.	19.32	1.64	1.117E-02	964.00	14.580	3.815E-01	EU152
					964.60	5.452	PBC<MDA	Ra228
969.22	38.	23.12	1.65	1.114E-02	968.90	17.460	PBC<MDA	Ra228
1001.40	27.	22.73	1.53	1.088E-02				
1004.80	11.	107.59	1.67	1.086E-02	1004.80	17.600	PBC<MDA	EU154
1085.80	12.	76.98	1.74	1.026E-02	1085.80	10.290	PBC<MDA	EU152
1120.82	45.	20.73	1.17	1.002E-02	1120.29	14.797	4.660E-01	BI214
1149.61	18.	33.83	1.78	9.837E-03				
1155.78	19.	34.73	1.79	9.797E-03				
1274.80	1.	841.63	1.88	9.092E-03	1274.80	35.500	PBC<MDA	EU154
1336.96	17.	30.68	2.43	8.758E-03				
1378.18	16.	52.47	1.96	8.551E-03	1377.67	3.919	PBC<MDA	BI214
1408.08	4.	215.49	1.98	8.401E-03	1408.08	21.210	PBC<MDA	EU152
1461.27	494.	4.55	2.04	8.150E-03	1460.75	10.700	9.747E+00	K40
1588.18	16.	25.00	1.75	7.596E-03				

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pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
1620.56	4.	132.88	2.13	7.464E-03	1620.56	2.750	PBC<MDA	BI212
1764.69	32.	19.95	0.39	6.916E-03	1764.49	15.357	PBC<MDA	BI214

***** U N I D E N T I F I E D P E A K S U M M A R Y *****

Peak Centroid Channel	Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma	FWHM %	Suspected Nuclide
95.06	23.99	91.	18.	1.292E+03	157.13	0.337	RH-106
230.28	57.76	78.	12.	3.487E+02	213.07	0.443	TH-234
270.92	67.91	98.	6.	1.656E+02	421.68	0.406	NP-239
298.24	74.75	191.	140.	3.373E+03	32.74	0.899	TH-234 sD
308.34	77.27	175.	156.	3.706E+03	28.75	0.901	PB-212 D
348.15	87.22	138.	69.	1.549E+03	53.91	0.910	PB-212 sD
359.50	90.05	148.	40.	8.819E+02	92.42	0.913	AC-228 sD
422.25	105.70	88.	28.	6.134E+02	104.20	0.673	AC-228 s
548.54	137.35	84.	21.	4.799E+02	133.60	0.954	BR-82 sc
556.14	139.25	100.	10.	2.425E+02	280.22	0.956	CE-143 sc
623.88	156.05	84.	25.	6.298E+02	111.62	0.294	TA-182 s
753.15	188.55	88.	22.	6.081E+02	128.66	0.999	FE-59 sD
766.41	191.87	78.	14.	3.871E+02	189.73	1.002	CS-138 sc
836.81	209.49	70.	33.	9.955E+02	79.08	1.017	AC-228 sD
848.40	212.39	65.	12.	3.678E+02	196.16	1.020	NP-237 sc
891.24	222.82	39.	8.	2.589E+02	217.98	0.743	BA-133 sc
1040.35	260.39	40.	5.	1.888E+02	332.59	0.240	- sc
1289.01	322.14	18.	6.	2.665E+02	185.26	0.343	- sc
1432.94	358.08	15.	9.	3.859E+02	141.28	0.498	J-131 sc
1520.43	379.92	27.	20.	9.454E+02	89.98	1.452	MO-99 s
1687.05	421.52	17.	8.	3.950E+02	160.89	0.258	CS-138 sc
1936.27	483.75	13.	7.	4.085E+02	151.30	0.464	- sc
2082.28	520.20	10.	9.	4.999E+02	121.55	0.480	- s
2209.71	552.01	22.	21.	1.297E+03	91.01	0.347	W-187 s
2686.58	671.06	6.	2.	1.041E+02	447.21	0.198	J-132 sc
3028.11	756.32	6.	15.	1.131E+03	70.80	0.466	ZR-95 s
3866.64	965.33	29.	26.	2.331E+03	70.52	1.642	AC-228 sD
4009.94	1001.40	4.	27.	2.499E+03	45.46	1.535	TA-182 s
4603.75	1149.66	10.	18.	1.848E+03	67.66	1.785	CS-138 sD
4628.47	1155.82	12.	19.	1.929E+03	69.45	1.789	BI-214 sD
5354.47	1336.96	3.	17.	1.964E+03	61.35	2.428	CO-60 s
6361.25	1588.18	0.	16.	2.106E+03	50.00	1.747	AC-228 s
7073.62	1765.95	25.	12.	1.743E+03	130.04	2.232	RH-106 sD

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 L - Peak written from unknown list.
 C - Area < Critical level.

 This section based on library: ITSI COUNT.Lib

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***** I D E N T I F I E D P E A K S U M M A R Y *****

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma	FWHM % keV
EU-152	157.23	39.52	683.	-22.	-0.006	339.53	0.868s
EU-152	159.64	40.12	661.	-15.	-0.004	485.79	0.868s
EU-152	180.78	45.40	683.	-22.	-0.006	337.47	0.873s
PB-210	185.99	46.70	156.	41.	0.011	99.42	0.669
EU-154	193.99	48.70	375.	16.	0.005	339.95	0.876s
Am-241	237.40	59.54	575.	11.	0.003	608.40	0.886
U-238	252.42	63.29	606.	-19.	-0.005	364.76	0.889s
U-238	368.90	92.38	1188.	-53.	-0.015	134.03	0.915
U-238	370.59	92.80	1089.	-36.	-0.010	85.95	0.915A
PA-234	393.17	98.44	261.	-3.	-0.001	1362.66	0.920s
EU-152	486.63	121.78	295.	23.	0.006	215.68	0.941s
EU-154	491.92	123.10	290.	-15.	-0.004	330.21	0.942s
U-235	653.10	163.35	203.	-11.	-0.003	421.39	0.977
RA-226	744.65	186.21	136.	52.	0.014	71.17	0.997D
U-235	821.14	205.31	389.	-14.	-0.004	415.30	1.014s
PA-234	907.48	226.87	348.	-29.	-0.008	132.93	1.032
PB-212	954.57	238.63	118.	233.	0.065	18.71	1.043D
PB-214	967.99	241.98	115.	54.	0.015	63.02	1.046D
EU-152	978.76	244.67	701.	19.	0.005	388.43	1.048s
EU-154	992.26	248.04	769.	-23.	-0.006	338.25	1.051s
TL-208	1109.68	277.36	101.	16.	0.004	211.72	1.076s
PB-214	1181.18	295.21	56.	146.	0.041	22.35	1.092D
Pa-212	1200.71	300.09	373.	-11.	-0.003	235.45	1.096s
Ra-228	1353.69	338.29	61.	82.	0.023	39.92	0.543s
EU-152	1377.77	344.30	73.	16.	0.004	174.06	1.134
PB-214	1408.09	351.87	68.	184.	0.051	20.97	0.841s
TL-208	2044.31	510.72	111.	156.	0.043	24.85	2.524s
PA-234	2278.79	569.26	46.	7.	0.002	345.30	1.323s
TL-208	2334.87	583.26	52.	115.	0.032	29.99	1.223
EU-154	2368.67	591.70	51.	15.	0.004	171.08	1.342
BI-214	2439.86	609.47	56.	150.	0.042	24.84	0.890s
CS-137	2648.91	661.66	51.	-12.	-0.003	210.75	1.399s
PA-234	2798.88	699.10	60.	-12.	-0.003	227.30	1.430s
EU-154	2895.82	723.30	137.	-17.	-0.005	202.87	1.449s
BI-212	2911.32	727.17	156.	-3.	-0.001	1501.74	1.452s
PA-234	2934.68	733.00	148.	3.	0.001	1279.78	1.457s
EU-154	3029.62	756.70	44.	-2.	0.000	1050.57	1.476s
TL-208	3056.06	763.30	66.	-11.	-0.003	212.32	1.482s
BI-214	3076.31	768.36	102.	6.	0.002	514.64	1.486s
EU-152	3118.55	778.90	51.	-7.	-0.002	357.81	1.494s
BI-212	3144.67	785.42	53.	-9.	-0.003	321.70	1.499
PA-234	3235.53	808.10	35.	2.	0.000	1170.21	1.518s
PA-234	3327.67	831.10	42.	6.	0.002	363.58	1.536s
TL-208	3443.98	860.13	12.	31.	0.008	58.98	0.349s

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Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-152	3473.05	867.39	34.	10.	0.003	170.34	1.565s
EU-154	3496.33	873.20	54.	-6.	-0.002	338.39	1.569s
PA-234	3525.61	880.51	44.	1.	0.000	1886.80	1.575s
PA-234	3536.55	883.24	44.	0.	0.000	2000.00	1.578s
PA-234	3598.08	898.60	26.	5.	0.001	385.05	1.590s
Ra-228	3649.83	911.52	16.	85.	0.024	26.75	0.803s
PA-234	3710.66	926.70	22.	12.	0.003	156.43	1.612s
BI-214	3739.01	933.78	9.	22.	0.006	62.46	0.310s
PA-234	3787.98	946.00	44.	10.	0.003	200.09	1.627s
PA-234	3800.00	949.00	40.	9.	0.002	220.87	1.629s
EU-152	3860.10	964.00	125.	-14.	-0.004	232.07	1.641s
Ra-228	3862.50	964.60	100.	2.	0.000	1727.45	1.642s
Ra-228	3879.73	968.90	74.	9.	0.002	286.90	1.645s
EU-154	3989.51	996.30	81.	-3.	-0.001	915.85	1.667s
EU-154	4023.56	1004.80	65.	11.	0.003	215.19	1.673s
EU-152	4348.09	1085.80	24.	12.	0.003	153.96	1.736s
EU-152	4453.35	1112.07	44.	-5.	-0.001	472.72	1.756s
BI-214	4488.40	1120.82	20.	39.	0.011	49.59	1.169s
CO-60	4698.44	1173.24	36.	0.	0.000	2000.00	1.802
BI-214	4958.38	1238.11	68.	-2.	-0.001	1295.83	1.852s
EU-154	5105.40	1274.80	29.	1.	0.000	1683.25	1.879s
CO-60	5336.62	1332.50	63.	-15.	-0.004	161.52	1.922s
BI-214	5517.62	1377.67	16.	16.	0.005	104.93	1.955s
PA-234	5583.46	1394.10	19.	-8.	-0.002	211.66	1.967s
EU-152	5639.49	1408.08	19.	4.	0.001	430.99	1.978s
K-40	5852.63	1461.27	16.	481.	0.134	9.49	2.042
BI-212	6491.04	1620.56	5.	4.	0.001	265.75	2.130s
BI-214	7067.93	1764.49	35.	5.	0.001	334.58	2.231s

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide -	Average	----- Peak -----						
Name	Code	Activity	Energy	Activity	Code	MDA	Value	COMMENTS
		pCi/g	keV	pCi/g		pCi/g		
U-235		6.7918E-03					1.39E+09	
			143.76	6.792E-03	&(	4.084E-01	1.78E+03	1.05E+01 G
			205.31	1.499E-01	&	1.047E+00	2.08E+02	4.70E+00 G
			163.35	1.033E-01	+	6.607E-01	2.11E+02	4.70E+00 G
RA-226		6.9224E-01					5.84E+05	
			186.21	6.922E-01	(P	7.630E-01	3.56E+01	3.64E+00 G K

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Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Ra-228	4.6555E-01					2.10E+03	
		911.07	4.447E-01	(P	1.119E-01	1.34E+01	2.90E+01 G
		968.90	7.968E-02	- P	3.876E-01	1.43E+02	1.75E+01 G
		338.40	5.159E-01	(P	2.441E-01	2.00E+01	1.20E+01 G
		964.60	4.812E-02	- P	1.432E+00	8.64E+02	5.45E+00 G
Am-241	T 1.6074E-02					1.58E+05	
		59.54	1.607E-02	?(	1.642E-01	3.04E+02	3.59E+01 G K
PB-210	6.8682E-01					7.45E+03	
		46.52	6.868E-01	(P	1.021E+00	4.97E+01	4.00E+00 G
U-238	-2.3737E-01					1.63E+12	
		63.29	-2.374E-01	?(P	1.463E+00	1.82E+02	3.90E+00 G
		92.80	-4.682E-01	} P	2.039E+00	4.30E+01	3.00E+00 G
		92.38	-8.122E-01	} P	2.486E+00	6.70E+01	2.57E+00 G
K-40	9.7466E+00					4.68E+11	
		1460.75	9.747E+00	(P	4.330E-01	4.74E+00	1.07E+01 G
PB-214	4.4271E-01					5.84E+05	
		351.92	3.989E-01	(P	8.866E-02	1.05E+01	3.58E+01 G
		295.21	5.363E-01	(P	1.382E-01	1.12E+01	1.85E+01 G
		241.98	4.208E-01	(P	4.115E-01	3.15E+01	7.50E+00 G
BI-214	4.0464E-01					5.84E+05	
		609.31	3.844E-01	(P	9.630E-02	1.24E+01	4.48E+01 G
		1764.49	8.714E-02	- P	5.024E-01	1.67E+02	1.54E+01 G
		1120.29	4.660E-01	(P	2.798E-01	2.48E+01	1.48E+01 G
		1238.11	-7.787E-02	-	1.338E+00	6.48E+02	5.86E+00 G
		768.36	1.601E-01	& P	1.397E+00	2.57E+02	4.80E+00 G
		1377.67	8.693E-01	+ P	1.111E+00	5.25E+01	3.92E+00 G
		934.06	1.122E+00	+	8.514E-01	3.12E+01	3.03E+00 G
BI-212	3.6678E-02					2.10E+03	
		727.17	-2.784E-02	?(P	6.700E-01	7.51E+02	1.18E+01 G
		1620.56	3.135E-01	&(P	1.162E+00	1.33E+02	2.75E+00 G
		785.42	-6.411E-01	+ P	2.515E+00	1.61E+02	2.00E+00 G
PB-212	3.1334E-01					2.10E+03	
		238.63	3.133E-01	(P	7.185E-02	9.35E+00	4.31E+01 G
		300.09	-2.382E-01	- P	1.950E+00	1.18E+02	3.27E+00 G
TL-208	1.4986E-01					2.10E+03	
		583.14	1.493E-01	(P	4.685E-02	1.50E+01	8.60E+01 G
		510.72	7.050E-01	+	2.331E-01	1.24E+01	2.25E+01 G
		860.47	3.719E-01	+	2.324E-01	2.95E+01	1.20E+01 G

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 1:43:21 PM
 AAA Spectrum name: ARS03250.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		277.36	1.570E-01	?(P	4.937E-01	1.06E+02	6.50E+00 G
		763.30	8.918E-01	-	3.208E+00	1.06E+02	1.70E+00 G
PA-234	7.4481E-02					1.65E+12	
		98.44	4.001E-03	&(P	1.204E-01	6.81E+02	2.51E+01 G
		946.00	7.718E-02	?(	2.624E-01	1.00E+02	2.00E+01 G
		131.28	3.242E-03	%	1.525E-01	1.48E+03	2.00E+01 G
		94.67	6.786E-04	% P	3.869E-01	6.22E+03	1.55E+01 G
		883.24	0.000E+00	-	4.162E-01	1.00E+03	1.20E+01 G
		926.70	1.607E-01	&(	3.459E-01	7.82E+01	1.10E+01 G
		569.26	7.368E-02	&(P	3.612E-01	1.73E+02	1.04E+01 G
		111.00	1.637E-03	% P	3.388E-01	6.57E+03	8.55E+00 G
		733.00	4.144E-02	?(	9.114E-01	6.40E+02	8.50E+00 G
		949.00	1.737E-01	?(P	6.418E-01	1.10E+02	7.80E+00 G
		880.51	2.280E-02	?(	7.666E-01	9.43E+02	6.50E+00 G
		226.87	2.484E-01	+ P	7.701E-01	6.65E+01	6.50E+00 G
		831.10	1.627E-01	?(	8.329E-01	1.82E+02	5.60E+00 G
		808.10	5.128E-02	?(	8.648E-01	5.85E+02	4.90E+00 G
		99.70	1.195E-02	& P	6.558E-01	1.63E+03	4.70E+00 G
		699.10	3.293E-01	+	1.065E+00	1.14E+02	4.60E+00 G
		898.60	1.842E-01	?(P	9.967E-01	1.93E+02	4.00E+00 G
		1394.10	4.538E-01	+ P	1.246E+00	1.06E+02	3.90E+00 G
CS-137	-1.7115E-02					1.10E+04	
		661.66	1.711E-02	?(	5.133E-02	1.05E+02	8.52E+01 G
EU-152	5.1094E-02					4.64E+03	
		40.12	3.866E-02	&(	3.147E-01	2.43E+02	3.00E+01 G
		121.78	3.109E-02	&(	1.121E-01	1.08E+02	2.92E+01 G
		344.30	4.563E-02	?(	1.198E-01	8.70E+01	2.70E+01 G
		1408.08	3.968E-02	?(	2.284E-01	2.15E+02	2.12E+01 G
		39.52	1.072E-01	&	6.084E-01	1.70E+02	1.60E+01 G
		964.00	1.517E-01	+	5.939E-01	1.16E+02	1.46E+01 G
		1112.07	6.713E-02	&	4.349E-01	2.36E+02	1.36E+01 G
		778.90	7.542E-02	+	3.776E-01	1.79E+02	1.30E+01 G
		1085.80	2.073E-01	(	4.259E-01	7.70E+01	1.03E+01 G
		45.40	1.675E-01	+	9.443E-01	1.69E+02	9.00E+00 G
		244.67	1.504E-01	?(	9.770E-01	1.94E+02	7.62E+00 G
		867.39	3.631E-01	?(	1.044E+00	8.52E+01	4.18E+00 G
EU-154	4.0673E-02					3.10E+03	
		123.10	1.449E-02	?(	8.050E-02	1.65E+02	4.05E+01 G
		1274.80	6.572E-03	?(	1.518E-01	8.42E+02	3.55E+01 G
		723.30	1.102E-01	+	3.754E-01	1.01E+02	1.97E+01 G
		1004.80	1.022E-01	?(	3.731E-01	1.08E+02	1.76E+01 G
		43.00	2.096E-08	%	6.658E-01	9.42E+08	1.31E+01 G
		873.20	8.266E-02	+	4.833E-01	1.69E+02	1.13E+01 G
		996.30	4.234E-02	+	6.744E-01	4.58E+02	1.07E+01 G

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 1:43:21 PM
 AAA Spectrum name: ARS03250.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		42.31-3.822E-08	%	1.214E+00	9.42E+08	7.30E+00	G
		248.04-2.111E-01	+	1.192E+00	1.69E+02	6.60E+00	G
		591.70	3.647E-01	(	8.798E-01	8.55E+01	4.60E+00 G
		48.70	2.474E-01	?(	1.412E+00	1.70E+02	4.20E+00 G
		756.70-5.855E-02	+	1.091E+00	5.25E+02	4.10E+00	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

! - Peak is part of a multiplet and this area went negative during deconvolution.

? - Peak is too narrow.

@ - Peak is too wide at FW25M, but ok at FWHM.

% - Peak fails sensitivity test.

\$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

+ - Peak activity higher than counting uncertainty range.

- - Peak activity lower than counting uncertainty range.

= - Peak outside analysis energy range.

& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.

P - Peakbackground subtraction

} - Peak is too close to another for the activity to be found directly.

Nuclide Codes:

T - Thermal Neutron Activation
 F - Fast Neutron Activation
 I - Fission Product
 N - Naturally Occurring Isotope
 P - Photon Reaction
 C - Charged Particle Reaction
 M - No MDA Calculation
 R - Coincidence Corrected
 H - Half-life limit exceeded

Peak Codes:

G - Gamma Ray
 X - X-Ray
 P - Positron Decay
 S - Single-Escape
 D - Double-Escape
 K - Key Line
 A - Not in Average
 C - Coincidence Peak

***** D I S C A R D E D I S O T O P E P E A K S *****

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	Activity
EU-152	39.52	683.	-22.	-0.006	339.53	-1.072E-01
EU-152	40.12	661.	-15.	-0.004	485.79	-3.866E-02
EU-152	45.40	683.	-22.	-0.006	337.47	-1.675E-01
EU-154	48.70	375.	16.	0.005	339.95	2.474E-01
Am-241	59.54	575.	11.	0.003	608.40	1.607E-02
U-238	63.29	606.	-19.	-0.005	364.76	-2.374E-01 P
U-238	92.38	1188.	-53.	-0.015	134.03	-8.122E-01 P
U-238	92.80	1089.	-36.	-0.010	85.95	-4.682E-01 P
PA-234	98.44	261.	-3.	-0.001	1362.66	-4.001E-03 P
EU-152	121.78	295.	23.	0.006	215.68	3.109E-02

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 AAA Spectrum name: ARS03250.An1

Nuclide	Channel	Energy	Background	Net area	Cnts/sec	Uncert	FWHM
EU-154	123.10	290.	-15.	-0.004	330.21	-1.449E-02	
U-235	163.35	203.	-11.	-0.003	421.39	-1.033E-01	
U-235	205.31	389.	-14.	-0.004	415.30	-1.499E-01	
PA-234	226.87	348.	-29.	-0.008	132.93	-2.484E-01	P
EU-152	244.67	701.	19.	0.005	388.43	1.504E-01	
EU-154	248.04	769.	-23.	-0.006	338.25	-2.111E-01	
EU-152	344.30	73.	16.	0.004	174.06	4.563E-02	
PA-234	569.26	46.	7.	0.002	345.30	7.368E-02	P
EU-154	591.70	51.	15.	0.004	171.08	3.647E-01	
CS-137	661.66	51.	-12.	-0.003	210.75	-1.711E-02	
PA-234	699.10	60.	-12.	-0.003	227.30	-3.293E-01	
EU-154	723.30	137.	-17.	-0.005	202.87	-1.102E-01	
BI-212	727.17	156.	-3.	-0.001	1501.74	-2.784E-02	P
PA-234	733.00	148.	3.	0.001	1279.78	4.144E-02	
EU-154	756.70	44.	-2.	0.000	1050.57	-5.855E-02	
EU-152	778.90	51.	-7.	-0.002	357.81	-7.542E-02	
BI-212	785.42	53.	-9.	-0.003	321.70	-6.411E-01	P
PA-234	808.10	35.	2.	0.000	1170.21	5.128E-02	
PA-234	831.10	42.	6.	0.002	363.58	1.627E-01	
EU-152	867.39	34.	10.	0.003	170.34	3.631E-01	
EU-154	873.20	54.	-6.	-0.002	338.39	-8.266E-02	
PA-234	880.51	44.	1.	0.000	1886.80	2.280E-02	
PA-234	898.60	26.	5.	0.001	385.05	1.842E-01	P
PA-234	926.70	22.	12.	0.003	156.43	1.607E-01	
PA-234	946.00	44.	10.	0.003	200.09	7.718E-02	
PA-234	949.00	40.	9.	0.002	220.87	1.737E-01	P
EU-152	964.00	125.	-14.	-0.004	232.07	-1.517E-01	
EU-154	996.30	81.	-3.	-0.001	915.85	-4.234E-02	
EU-154	1004.80	65.	11.	0.003	215.19	1.022E-01	
EU-152	1085.80	24.	12.	0.003	153.96	2.073E-01	
EU-152	1112.07	44.	-5.	-0.001	472.72	-6.713E-02	
EU-154	1274.80	29.	1.	0.000	1683.25	6.572E-03	
CO-60	1332.50	63.	-15.	-0.004	161.52	-2.953E-02	
PA-234	1394.10	19.	-8.	-0.002	211.66	-4.538E-01	P
EU-152	1408.08	19.	4.	0.001	430.99	3.968E-02	
BI-212	1620.56	5.	4.	0.001	265.75	3.135E-01	P

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
U-235 #A	6.7918E-03	2.4151E-01	2.4151E-01	0.408E+00
RA-226 A	6.9224E-01	4.9263E-01	4.9459E-01	0.763E+00
Ra-228	4.6555E-01	1.1186E-01	1.1566E-01	0.112E+00
Am-241 #A	1.6074E-02	9.7796E-02	9.7801E-02	0.164E+00

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 AAA Spectrum name: ARS03250.An1

PB-210	A	6.8682E-01	6.8283E-01	6.8618E-01	0.102E+01
U-238	#A	-2.3737E-01	8.6582E-01	8.6601E-01	0.146E+01
K-40		9.7466E+00	9.2493E-01	1.1166E+00	0.433E+00
PB-214		4.4271E-01	9.2820E-02	1.0040E-01	0.887E-01
BI-214		4.0464E-01	1.0050E-01	1.0339E-01	0.963E-01
BI-212	#A	3.6678E-02	9.7473E-02	9.7501E-02	0.670E+00
PB-212		3.1334E-01	5.8619E-02	6.3255E-02	0.719E-01
TL-208		1.4986E-01	4.4944E-02	4.5926E-02	0.469E-01
PA-234	#A	7.4481E-02	1.1651E-01	1.1664E-01	0.120E+00
CS-137	#A	-1.7115E-02	3.6070E-02	3.6076E-02	0.513E-01
CO-60	#A	0.0000E+00	1.9329E-02	1.9329E-02	0.560E-01
EU-152	#A	5.1094E-02	6.1163E-02	6.1431E-02	0.315E+00
EU-154	#A	4.0673E-02	6.9582E-02	6.9637E-02	0.805E-01

- All peaks for activity calculation had bad shape.
 * - Activity omitted from total
 & - Activity omitted from total and all peaks had bad shape.
 < - MDA value printed.
 A - Activity printed, but activity < MDA.
 B - Activity < MDA and failed test.
 C - Area < Critical level.
 F - Failed fraction or key line test.
 H - Half-life limit exceeded

----- S U M M A R Y -----
 Total Activity (2.8 to 1997.0 keV) 1.290E+01 pCi/g

Analyzed by: _____
 Countroom

Reviewed by: _____
 Supervisor

Laboratory: AAA


ARS Aleut Analytical, LLC
Port Allen Laboratory

Aliquot Report

Printed: 10/2/2023 11:12 AM
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 SDG ARS1-23-01973											
Fraction	Cnt	Client ID	Aliquot	Units	Geometry	Prep Type	Origin	Origin2	ICOC ID	User	Date
001	1	HPPC-ESU-315A-031	Plastic Zip Bag (25%-<50%)	NA		ORIG	SCI		447544	LHERBERT	9/7/2023 14:35
001	1	HPPC-ESU-315A-031	633.93	g	Other Geometry	DRYF	PRP		447549	KGALLAGHER	9/7/2023 14:53
001	1	HPPC-ESU-315A-031	415.99	g	250 mL (8oz.) Tuna Can	DGAM	PRP		447634	KGALLAGHER	9/8/2023 14:08
002	1	HPPC-ESU-315A-032	Plastic Zip Bag (25%-<50%)	NA		ORIG	SCI		447545	LHERBERT	9/7/2023 14:35
002	1	HPPC-ESU-315A-032	673	g	Other Geometry	DRYF	PRP		447550	KGALLAGHER	9/7/2023 14:53
002	1	HPPC-ESU-315A-032	424.63	g	250 mL (8oz.) Tuna Can	DGAM	PRP		447635	KGALLAGHER	9/8/2023 14:09
003	1	HPPC-ESU-315A-033	Plastic Zip Bag (25%-<50%)	NA		ORIG	SCI		447546	LHERBERT	9/7/2023 14:35
003	1	HPPC-ESU-315A-033	652.39	g	Other Geometry	DRYF	PRP		447551	KGALLAGHER	9/7/2023 14:54
003	1	HPPC-ESU-315A-033	395.54	g	250 mL (8oz.) Tuna Can	DGAM	PRP		447636	KGALLAGHER	9/8/2023 14:09
003	1	HPPC-ESU-315A-033	652.39	g	Other Geometry	DRYF	PRP		447639	KGALLAGHER	9/8/2023 14:17
003	1	HPPC-ESU-315A-033	3.011	g	50mL Centrifuge Tube	DRAD	PRO	PALA-RAD-032	447712	KEASTMAN	9/12/2023 7:29
004	1	HPPC-ESU-315A-033-FD	Plastic Zip Bag (25%-<50%)	NA		ORIG	SCI		447547	LHERBERT	9/7/2023 14:35
004	1	HPPC-ESU-315A-033-FD	626.6	g	Other Geometry	DRYF	PRP		447552	KGALLAGHER	9/7/2023 14:54
004	1	HPPC-ESU-315A-033-FD	396.74	g	250 mL (8oz.) Tuna Can	DGAM	PRP		447637	KGALLAGHER	9/8/2023 14:10
004	1	HPPC-ESU-315A-033-FD	626.6	g	Other Geometry	DRYF	PRP		447640	KGALLAGHER	9/8/2023 14:18
004	1	HPPC-ESU-315A-033-FD	3.01	g	50mL Centrifuge Tube	DRAD	PRO	PALA-RAD-032	447713	KEASTMAN	9/12/2023 7:32
005	1	HPPC-ESU-315A-034	Plastic Zip Bag (25%-<50%)	NA		ORIG	SCI		447548	LHERBERT	9/7/2023 14:35
005	1	HPPC-ESU-315A-034	721.21	g	Other Geometry	DRYF	PRP		447553	KGALLAGHER	9/7/2023 14:55
005	1	HPPC-ESU-315A-034	424.71	g	250 mL (8oz.) Tuna Can	DGAM	PRP		447638	KGALLAGHER	9/8/2023 14:10

Prep Batch Report

	Prep Batch ID ARS1-P23-01206							
	Matrix	SO						
	Prep Batch Type	GammaDry						
PBatch Sample ID	Basis	SDG	FR	Dup	Notes	Storage	Client ID	Lab Deadline
ARS1-P23-01206-01	DG21	ARS1-23-01973	001			PrePrep	HPPC-ESU-315A-031	10/02/23
ARS1-P23-01206-02	DG21	ARS1-23-01973	002			PrePrep	HPPC-ESU-315A-032	10/02/23
ARS1-P23-01206-03	DG21, DRAD	ARS1-23-01973	003			PrePrep	HPPC-ESU-315A-033	10/02/23
ARS1-P23-01206-04	DG21, DRAD	ARS1-23-01973	004			PrePrep	HPPC-ESU-315A-033-FD	10/02/23
ARS1-P23-01206-05	DG21	ARS1-23-01973	005			PrePrep	HPPC-ESU-315A-034	10/02/23



Prep Batch Report - Gamma Spec Aliquot

Prep Batch ID	SDG	FR	Dup	ICOC	Parent ID	Type	Geometry	Tare g	Cont+Smp g	Net Sample g	Balance
ARS1-P23-01206-01	ARS1-23-01973	001		447634	447544	DG21	250 mL (8oz.) Tuna Can	42.06	458.05	415.99	1339
ARS1-P23-01206-02	ARS1-23-01973	002		447635	447545	DG21	250 mL (8oz.) Tuna Can	42.71	467.34	424.63	1339
ARS1-P23-01206-03	ARS1-23-01973	003		447636	447546	DG21, DRAD	250 mL (8oz.) Tuna Can	42.09	437.63	395.54	1339
ARS1-P23-01206-04	ARS1-23-01973	004		447637	447547	DG21, DRAD	250 mL (8oz.) Tuna Can	41.97	438.71	396.74	1339
ARS1-P23-01206-05	ARS1-23-01973	005		447638	447548	DG21	250 mL (8oz.) Tuna Can	42.28	466.99	424.71	1339



Prep Batch Report - Percent Moisture

Prep Batch ID	SDG	FR	Dup	ICOC	Parent ID	Tare g	Cont+Sample g	Net Sample g	Oven ID	Oven Temp C	Start Time	Stop Time	Cont+Smp g	Net Smp g	% Solid	% Moisture	Balance
ARS1-P23-01206-01	ARS1-23-01973	001		447549	447544	7.28	641.21	633.93	4	104	9/7/2023 15:21	9/8/2023 9:50	580.36	573.08	90.40%	9.60%	1339
ARS1-P23-01206-02	ARS1-23-01973	002		447550	447545	7.25	680.25	673.00	4	104	9/7/2023 15:21	9/8/2023 9:50	520.20	512.95	76.22%	23.78%	1339
ARS1-P23-01206-03	ARS1-23-01973	003		447551	447546	7.20	659.59	652.39	4	104	9/7/2023 15:21	9/8/2023 9:50	593.42	586.22	89.86%	10.14%	1339
ARS1-P23-01206-04	ARS1-23-01973	004		447552	447547	7.26	633.86	626.60	4	104	9/7/2023 15:21	9/8/2023 9:50	566.12	558.86	89.19%	10.81%	1339
ARS1-P23-01206-05	ARS1-23-01973	005		447553	447548	7.25	728.46	721.21	4	104	9/7/2023 15:21	9/8/2023 9:50	671.54	664.29	92.11%	7.89%	1339

ARS Aleut Analytical, LLC
Port Allen LaboratoryPrinted: 10/2/2023 11:12 AM
Page 1 of 2**Gamma Spectroscopy Logbook****ARS03**

Date	Time	ARS Batch Sample ID	Weight (g) or Volume (L)	Spectrum File Number	Geometry	Tech Initials
9/29/2023	11:33	ARS1-B23-01775-03	360.2	03249	250 mL (8oz.) Tuna Can	SDW
9/29/2023	9:24	ARS1-B23-01775-05	424.63	03247	250 mL (8oz.) Tuna Can	SDW
9/29/2023	10:29	ARS1-B23-01775-07	396.74	03248	250 mL (8oz.) Tuna Can	SDW
9/29/2023	12:43	ARS1-B23-01775-09	424.71	03250	250 mL (8oz.) Tuna Can	SDW

ARS Aleut Analytical, LLC
Port Allen LaboratoryPrinted: 10/2/2023 11:12 AM
Page 2 of 2

Gamma Spectroscopy Logbook

ARS06

Date	Time	ARS Batch Sample ID	Weight (g) or Volume (L)	Spectrum File Number	Geometry	Tech Initials
9/29/2023	8:54	ARS1-B23-01775-01	1595-98-4	06049	250 mL (8oz.) Tuna Can	SDW
9/29/2023	9:07	ARS1-B23-01775-02	1595-98-4	06050	250 mL (8oz.) Tuna Can	SDW
9/29/2023	9:23	ARS1-B23-01775-04	415.99	06051	250 mL (8oz.) Tuna Can	SDW
9/29/2023	10:28	ARS1-B23-01775-06	395.54	06052	250 mL (8oz.) Tuna Can	SDW
9/29/2023	11:33	ARS1-B23-01775-08	424.71	06053	250 mL (8oz.) Tuna Can	SDW



ARS Aleut Analytical, LLC Analytical Reports

for

GES-AIS, LLC

Gamma Spec - ICAL

66 121977



Instrument ID: ARS03 Calibration Verification

STD#	1948-64-2 poly	Meas Act	Criteria	Dif	%dif	Pass/Fail
Nuclide	uCi	pCi				
Pb210	0.2242	224200	2.31E+05	10.00%	7060	3.15% PASS
Am241	0.02186	21860	2.10E+04	5.00%	853	3.90% PASS
Cd109	0.2082	208200	2.13E+05	10.00%	4950	2.38% PASS
Co57	0.008301	8301	8.07E+03	10.00%	231	2.78% PASS
Te123m	0.01074	10740	1.11E+04	10.00%	326	3.04% PASS
Cr51	0.2604	260400	4.12E+05	10.00%	151670	58.25% Fail
Sn113	0.03932	39320	4.07E+04	10.00%	1370	3.48% PASS
Sr85	0.05209	52090	5.10E+04	10.00%	1120	2.15% PASS
Cs137	0.03603	36030	3.55E+04	5.00%	485	1.35% PASS
Y88	0.08142	81420	8.30E+04	10.00%	1616	1.98% PASS
Co60	0.04295	42950	4.21E+04	5.00%	824	1.92% PASS

Independent Standard

STD#	1891-50-3	Meas Act	Criteria	Dif	%dif	Pass/Fail
Nuclide	uCi	pCi				
Pb210	0.2119	211900	2.14E+05	10.00%	1990	0.94% PASS
Am241	0.02087	20870	2.02E+04	5.00%	660	3.16% PASS
Cd109	0.2192	219200	2.19E+05	10.00%	70	0.03% PASS
Co57	0.007577	7577	7.62E+03	10.00%	46.1	0.61% PASS
Te123m	0.01084	10840	1.18E+04	10.00%	928	8.56% PASS
Cr51	0.2502	250200	10.00%	250200	100.00%	NOT MEASURED
Sn113	0.04008	40080	5.42E+04	10.00%	14102	35.18% Fail
Sr85	0.04834	48340	4.29E+04	10.00%	5417	11.21% Fail
Cs137	0.03344	33440	3.45E+04	5.00%	1013	3.03% PASS
Y88	0.07737	77370	7.72E+04	10.00%	145	0.19% PASS
Co60	0.04132	41320	4.04E+04	5.00%	948	2.29% PASS

Calibration Data from file: 250mL tuna can poly 1948-64-2 calib.Clb

Energy Calibration Date: 12/19/17 Time: 09:01:57

Efficiency Calibration Date: 12/19/17 Time: 10:15:29

Calibration Description:

250mL tuna can poly 1948-64-2
12-19-17 EEC

Energy Calibration Fit

Energy = $0.3823 + 0.250027 * \text{Channel} - 2.90278e-008 * \text{Channel}^2$
FWHM (ch) = $3.3907 + 0.001038 * \text{Channel} - 4.27492e-009 * \text{Channel}^2$

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
184.87	46.52	46.60	-0.18%	0.88	0.90	-2.29%
236.83	59.54	59.59	-0.09%	0.89	0.91	-2.66%
350.71	88.03	88.06	-0.03%	0.93	0.94	-0.56%
486.76	122.07	122.08	-0.01%	0.98	0.97	0.77%
634.34	159.00	158.97	0.02%	1.04	1.01	3.18%
1564.56	391.69	391.49	0.05%	1.27	1.25	1.83%
2054.24	513.99	513.87	0.02%	1.37	1.38	-0.05%
2645.74	661.66	661.69	-0.00%	1.52	1.53	-0.25%
3591.86	898.02	898.07	-0.01%	1.76	1.76	-0.01%
4693.79	1173.24	1173.32	-0.01%	2.06	2.04	0.84%
5331.53	1332.50	1332.58	-0.01%	2.16	2.20	-1.97%
7347.71	1836.01	1835.94	0.00%	2.71	2.69	0.54%

Efficiency Calibration Fit

Polynomial Uncertainty = 1.0072 %

Coefficients:

-0.406222 -4.708818 0.336784 -0.027319 0.000788 -0.000008

Efficiency Table

Energy	Efficiency	Fit	Delta
46.52	1.9845E-002	1.9790E-002	0.27%
59.54	2.5558E-002	2.5734E-002	-0.69%
88.03	3.3425E-002	3.2820E-002	1.81%
122.07	3.2303E-002	3.2253E-002	0.16%
159.00	2.7831E-002	2.8672E-002	-3.02%
391.69	1.5862E-002	1.5400E-002	2.91%
513.99	1.2789E-002	1.2777E-002	0.09%
661.66	1.0975E-002	1.0799E-002	1.61%
898.02	8.6514E-003	8.8143E-003	-1.88%
1173.24	7.2127E-003	7.3158E-003	-1.43%
1332.50	6.5224E-003	6.6548E-003	-2.03%
1836.01	5.2046E-003	5.0966E-003	2.08%

Calibration Certificate Table

Isotope	Energy	Pct	Half-life	Activity	GPS	Error	Date & Time	
Pb-210	46.52	4.18	8.14E+003	0.22	346.75	4.10%	06/01/17	14:00:00
Am-241	59.54	36.00	1.58E+005	0.02	291.18	3.00%	06/01/17	14:00:00
Cd-109	88.03	3.63	4.63E+002	0.21	279.63	3.20%	06/01/17	14:00:00
Co-57	122.07	85.60	2.72E+002	0.01	262.91	3.20%	06/01/17	14:00:00
Te-123M	159.00	84.00	1.20E+002	0.01	333.80	3.10%	06/01/17	14:00:00
Cr-51	320.07	9.86	2.71E+001	0.26	949.99	3.00%	06/01/17	14:00:00
Sn-113	391.69	64.90	1.15E+002	0.04	944.19	3.00%	06/01/17	14:00:00
Sr-85	513.99	98.40	6.48E+001	0.05	1896.49	3.00%	06/01/17	14:00:00
Cs-137	661.66	85.10	1.10E+004	0.04	1134.48	3.10%	06/01/17	14:00:00
Y-88	898.02	94.00	1.07E+002	0.08	2831.79	3.00%	06/01/17	14:00:00
Co-60	1173.24	99.86	1.92E+003	0.04	1586.93	3.10%	06/01/17	14:00:00
Co-60	1332.50	99.98	1.92E+003	0.04	1588.83	3.10%	06/01/17	14:00:00
Y-88	1836.01	99.40	1.07E+002	0.08	2994.46	3.00%	06/01/17	14:00:00

ORTEC g v - i (3263) Env32 G53W4.22 19-DEC-2017 10:27:13 Page 1
 American Radiation Services Spectrum name: ARS02069.An1

Sample description

Batch ID: Cal Ver
 SDG ID: 1948-64-2 Tech: EEC

Spectrum Filename: C:\User\ARS02069.An1

Acquisition information

Start time: 19-Dec-2017 10:16:53
 Live time: 600
 Real time: 610
 Dead time: 1.57 %
 Detector ID: 1

Detector system

(ARS02) MCB 131

Calibration

Filename: 250mL tuna can poly 1948-64-2 calib.Clb
 250mL tuna can poly 1948-64-2
 12-19-17 EEC

Energy Calibration

Created: 19-Dec-2017 09:01:57
 Zero offset: 0.382 keV
 Gain: 0.250 keV/channel
 Quadratic: -2.903E-08 keV/channel^2

Efficiency Calibration

Created: 19-Dec-2017 10:15:29
 Type: Polynomial
 Uncertainty: 1.007 %
 Coefficients: -0.406222 -4.708818 0.336784
 -0.027319 0.000788 -0.000008

Library Files

Main analysis library: northamericancal.Lib
 Library Match Width: 0.500
 Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G53W4.22
 Start channel: 0 (0.38keV)
 Stop channel: 8000 (1998.74keV)
 Peak rejection level: 40.000%
 Peak search sensitivity: 3
 Sample Size: 1.0000E+00
 Activity scaling factor: 1.0000E+06/(1.0000E+00* 1.0000E+00) =
 1.0000E+06
 Detection limit method: Reg. Guide 4.16 Method
 Random error: 1.0000000E+00
 Systematic error: 1.0000000E+00
 Fraction Limit: 60.000%
 Background width: best method (based on spectrum).
 Half lives decay limit: 12.000

ORTEC g v - i (3263) Env32 G53W4.22 19-DEC-2017 10:27:13 Page 2
 American Radiation Services Spectrum name: ARS02069.An1

Activity range factor: 2.000
 Min. step backg. energy 0.000
 Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	01-Jun-2017 14:00:00
Decay during acquisition:	NO	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	pbc NorthAmericancal.pbc 13-Dec-2017 09:58:21
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 13 cutoff 20.00000 %
 Energy Calibration
 Normalized diff: 0.0468

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
13.32	89.	28.01	1.01	5.273E-03				
22.35	651.	6.69	0.87	9.205E-03				
25.13	494.	9.44	0.87	1.043E-02				
32.16	252.	21.73	1.21	1.354E-02				
46.64	3999.	2.43	0.87	1.984E-02	46.52	4.000	2.313E+05	PB210
59.59	4353.	2.33	0.84	2.576E-02	59.54	36.300	2.101E+04	AM241
88.06	4074.	2.51	0.95	3.282E-02	88.03	3.610	2.132E+05	CD109
122.07	2967.	2.88	0.98	3.225E-02	122.07	85.600	8.070E+03	CO57
136.36	407.	13.84	1.10	3.096E-02				
158.97	1839.	3.76	1.01	2.868E-02	159.00	83.500	1.107E+04	TE123M
319.64	105.	39.54	1.18	1.777E-02	320.07	9.830	PBC<MDA	CR51
391.48	2663.	2.74	1.21	1.541E-02	391.69	64.160	4.069E+04	SN113
513.99	1671.	3.68	1.38	1.278E-02	513.99	99.280	5.097E+04	SR85
661.65	7170.	1.38	1.60	1.080E-02	661.66	85.210	3.554E+04	CS137
690.65	111.	29.65	0.72	1.050E-02				
897.99	4104.	2.27	1.81	8.814E-03	898.02	95.000	8.143E+04	Y88
1173.28	6355.	1.42	1.96	7.316E-03	1173.24	99.900	4.211E+04	CO60
1258.75	42.	30.30	0.68	6.947E-03				
1332.54	5791.	1.42	2.19	6.655E-03	1332.50	99.982	4.215E+04	CO60
1835.81	2578.	2.04	2.55	5.097E-03	1836.01	99.350	8.457E+04	Y88

***** U N I D E N T I F I E D P E A K S U M M A R Y *****

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma	FWHM %	Suspected Nuclide
51.73	13.32	213.	89.	0.148	56.02	1.012	SE-75 s
87.57	22.28	772.	670.	1.116	17.01	0.992	RH-106
98.71	25.06	896.	633.	1.055	19.01	1.344	RH-106 s
127.10	32.16	821.	252.	0.419	43.45	1.211	J-131 s
543.89	136.36	828.	407.	0.678	27.68	1.101	HF-181
2761.65	690.65	243.	111.	0.185	59.30	0.715	- s
5035.89	1258.75	30.	42.	0.070	60.61	0.677	- s

ORTEC g v - i (3263) Env32 G53W4.22 19-DEC-2017 10:27:13 Page 3
 American Radiation Services Spectrum name: ARS02069.An1

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 L - Peak written from unknown list.
 C - Area < Critical level.

 This section based on library: northamericancal.Lib

***** I D E N T I F I E D P E A K S U M M A R Y *****							
Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
PB-210	185.00	46.64	1634.	3989.	6.648	4.85	0.874
AM-241	236.83	59.59	1550.	4353.	7.255	4.66	0.835
CD-109	350.71	88.06	1599.	4074.	6.790	5.02	0.947
CO-57	486.72	122.07	1450.	2967.	4.945	5.77	0.984
TE-123M	634.31	158.97	982.	1838.	3.064	7.52	1.008
CR-51	1277.09	319.64	809.	105.	0.175	79.09	1.177
SN-113	1564.49	391.48	778.	2663.	4.438	5.47	1.214
SR-85	2054.69	513.99	563.	1671.	2.785	7.36	1.377
CS-137	2645.62	661.65	575.	7170.	11.950	2.77	1.598
Y-88	3591.55	897.99	512.	4104.	6.840	4.55	1.808
CO-60	4693.67	1173.28	281.	6355.	10.592	2.84	1.964
CO-60	5331.35	1332.54	132.	5791.	9.652	2.83	2.185
Y-88	7347.20	1835.81	22.	2577.	4.295	4.07	2.552

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****						
- Nuclide -	Average	----- Peak -----				
Name Code	Activity	Energy	Activity	Code	MDA Value	COMMENTS
	pCi/g	keV	pCi/g		pCi/g	
PB-210	2.3126E+05	46.52	2.313E+05	(P	1.108E+04 2.43E+00	G
AM-241	2.1007E+04	59.54	2.101E+04	(P	8.986E+02 2.33E+00	G
CD-109	2.1315E+05	88.03	2.132E+05	(	9.891E+03 2.51E+00	G
CO-57	8.0700E+03	122.07	8.070E+03	(	4.900E+02 2.88E+00	G

ORTEC g v - i (3263) Env32 G53W4.22 19-DEC-2017 10:27:13 Page 4
 American Radiation Services Spectrum name: ARS02069.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
TE-123M	1.1066E+04	159.00	1.107E+04	(P	8.953E+02	3.76E+00	G
CR-51	4.1207E+05	320.07	4.121E+05	&(	5.310E+05	3.95E+01	G
SN-113	4.0690E+04	391.69	4.069E+04	(P	2.028E+03	2.74E+00	G
SR-85	5.0970E+04	513.99	5.097E+04	(	3.456E+03	3.68E+00	G
CS-137	3.5545E+04	661.66	3.554E+04	(	5.675E+02	1.38E+00	G
CO-60	4.2126E+04	1173.24	4.211E+04	(P	5.355E+02	1.42E+00	G
		1332.50	4.215E+04	(	4.094E+02	1.42E+00	G
Y-88	8.3036E+04	1836.01	8.457E+04	(P	8.020E+02	2.04E+00	G
		898.02	8.143E+04	(	2.146E+03	2.27E+00	G

(- This peak used in the nuclide activity average.

- * - Peak is too wide, but only one peak in library.
- ! - Peak is part of a multiplet and this area went negative during deconvolution.
- ? - Peak is too narrow.
- @ - Peak is too wide at FW25M, but ok at FWHM.
- % - Peak fails sensitivity test.
- \$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
- + - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
- = - Peak outside analysis energy range.
- & - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
- P - Peakbackground subtraction
- } - Peak is too close to another for the activity to be found directly.

Nuclide Codes:

T - Thermal Neutron Activation
 F - Fast Neutron Activation
 I - Fission Product
 N - Naturally Occurring Isotope
 P - Photon Reaction

Peak Codes:

G - Gamma Ray
 X - X-Ray
 P - Positron Decay
 S - Single-Escape
 D - Double-Escape

ORTEC g v - i (3263) Env32 G53W4.22 19-DEC-2017 10:27:13 Page 5
 American Radiation Services Spectrum name: ARS02069.An1

C - Charged Particle Reaction K - Key Line
 M - No MDA Calculation A - Not in Average
 R - Coincidence Corrected C - Coincidence Peak
 H - Halflife limit exceeded

```

***** S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E *****
      Time of Count   Time Corrected   Uncertainty   2 Sigma
Nuclide      Activity   Activity       Counting      Total      MDA
             pCi/g     pCi/g         pCi/g         pCi/g     pCi/g
-----
PB-210      2.2698E+05    2.3126E+05    1.1250E+04    2.5448E+04    1.108E+04
AM-241      2.0989E+04    2.1007E+04    9.7934E+02    1.9605E+03    8.986E+02
CD-109      1.5489E+05    2.1315E+05    1.0707E+04    2.0064E+04    9.891E+03
CO-57       4.8408E+03    8.0700E+03    4.6532E+02    7.2081E+02    4.900E+02
TE-123M     3.4586E+03    1.1066E+04    8.3257E+02    1.1500E+03    8.953E+02
CR-51      A    2.7057E+03    4.1207E+05    3.2590E+05    3.2719E+05    5.310E+05
SN-113      1.2138E+04    4.0690E+04    2.2267E+03    3.7702E+03    2.028E+03
SR-85       5.9330E+03    5.0970E+04    3.7525E+03    4.9436E+03    3.456E+03
CS-137      3.5099E+04    3.5545E+04    9.8304E+02    1.7459E+03    5.675E+02
CO-60       3.9187E+04    4.2126E+04    8.4455E+02    1.7735E+03    5.355E+02
Y-88        2.2512E+04    8.3036E+04    2.5346E+03    5.4612E+03    8.020E+02

```

< - MDA value printed.
 A - Activity printed, but activity < MDA.
 B - Activity < MDA and failed test.
 C - Area < Critical level.
 F - Failed fraction or key line test.
 H - Halflife limit exceeded

```

----- S U M M A R Y -----
Total Activity (    0.4 to 1998.7 keV)    5.287E+05 pCi/g
Total Decayed Activity (    0.4 to 1998.7 keV) 1.1489919E+06 pCi/g

```


ORTEC g v - i (3263) Env32 G53W4.22 19-DEC-2017 10:58:20 Page 1
 American Radiation Services Spectrum name: ARS02071.An1

Sample description

Batch ID: Calibration Verification
 SDG ID: 1891-50-3 Tech: EEC

Spectrum Filename: C:\User\ARS02071.An1

Acquisition information

Start time: 19-Dec-2017 10:48:05
 Live time: 600
 Real time: 607
 Dead time: 1.09 %
 Detector ID: 1

Detector system

(ARS02) MCB 131

Calibration

Filename: 250mL tuna can poly 1948-64-2 calib.Clb
 250mL tuna can poly 1948-64-2
 12-19-17 EEC

Energy Calibration

Created: 19-Dec-2017 09:01:57
 Zero offset: 0.382 keV
 Gain: 0.250 keV/channel
 Quadratic: -2.903E-08 keV/channel^2

Efficiency Calibration

Created: 19-Dec-2017 10:15:29
 Type: Polynomial
 Uncertainty: 1.007 %
 Coefficients: -0.406222 -4.708818 0.336784
 -0.027319 0.000788 -0.000008

Library Files

Main analysis library: northamericancal.Lib
 Library Match Width: 0.500
 Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G53W4.22
 Start channel: 0 (0.38keV)
 Stop channel: 8000 (1998.74keV)
 Peak rejection level: 40.000%
 Peak search sensitivity: 3
 Sample Size: 1.0000E+00
 Activity scaling factor: 1.0000E+06/(1.0000E+00* 1.0000E+00) =
 1.0000E+06
 Detection limit method: Reg. Guide 4.16 Method
 Random error: 1.0000000E+00
 Systematic error: 1.0000000E+00
 Fraction Limit: 60.000%
 Background width: best method (based on spectrum).
 Half lives decay limit: 12.000

ORTEC g v - i (3263) Env32 G53W4.22 19-DEC-2017 10:58:20 Page 2
 American Radiation Services Spectrum name: ARS02071.An1

Activity range factor: 2.000
 Min. step backg. energy 0.000
 Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	01-Aug-2016 14:00:00
Decay during acquisition:	NO	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	pbc NorthAmericancal.pbc 13-Dec-2017 09:58:21
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 11 cutoff 20.00000 %
 Energy Calibration
 Normalized diff: 0.0493

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
13.37	60.	32.82	0.88	5.295E-03				
22.39	400.	8.34	0.87	9.228E-03				
25.17	281.	11.86	0.87	1.045E-02				
32.25	230.	18.82	0.87	1.358E-02				
36.59	167.	25.50	0.83	1.549E-02				
46.60	3596.	2.49	0.86	1.983E-02	46.52	4.000	2.139E+05	PB210
59.58	4182.	2.15	0.89	2.575E-02	59.54	36.300	2.021E+04	AM241
88.11	2583.	3.80	0.89	3.283E-02	88.03	3.610	2.191E+05	CD109
122.07	1293.	4.21	0.95	3.225E-02	122.07	85.600	7.623E+03	CO57
136.62	214.	22.76	0.97	3.094E-02				
158.88	337.	14.63	0.85	2.868E-02	159.00	83.500	1.177E+04	TE123M
391.45	569.	8.11	1.18	1.541E-02	391.69	64.160	5.418E+04	SN113
661.65	6818.	1.33	1.51	1.080E-02	661.66	85.210	3.445E+04	CS137
786.48	65.	29.08	0.49	9.632E-03				
898.26	518.	13.66	1.90	8.813E-03	898.02	95.000	7.415E+04	Y88
1173.28	5524.	1.48	1.93	7.316E-03	1173.24	99.900	4.083E+04	CO60
1332.52	4916.	1.47	2.16	6.655E-03	1332.50	99.982	3.992E+04	CO60
1835.87	339.	5.43	1.65	5.097E-03	1836.01	99.350	8.017E+04	Y88

***** U N I D E N T I F I E D P E A K S U M M A R Y *****

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma	FWHM %	Suspected Nuclide
51.93	13.37	134.	60.	0.101	65.64	0.885	SE-75 s
87.78	22.33	386.	430.	0.717	18.89	0.836	RH-106
98.88	25.11	380.	316.	0.527	24.15	0.743	RH-106 s
127.46	32.25	495.	230.	0.384	37.64	0.874	XE-138
144.82	36.59	520.	167.	0.278	51.00	0.834	XE-138
544.93	136.62	564.	214.	0.357	45.52	0.971	LU-177
3145.22	786.48	89.	65.	0.109	58.15	0.495	PA-234M s

ORTEC g v - i (3263) Env32 G53W4.22 19-DEC-2017 10:58:20 Page 3
 American Radiation Services Spectrum name: ARS02071.An1

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 L - Peak written from unknown list.
 C - Area < Critical level.

 This section based on library: northamericancal.Lib

***** I D E N T I F I E D P E A K S U M M A R Y *****							
Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
PB-210	184.86	46.60	1273.	3586.	5.977	4.98	0.864
AM-241	236.77	59.58	1059.	4182.	6.970	4.29	0.893
CD-109	350.90	88.11	784.	2583.	4.305	7.60	0.894
CO-57	486.74	122.07	581.	1293.	2.155	8.42	0.955
TE-123M	633.97	158.88	548.	336.	0.560	29.26	0.855s
SN-113	1564.40	391.45	361.	568.	0.947	16.22	1.176s
CS-137	2645.62	661.65	306.	6818.	11.363	2.67	1.514
Y-88	3592.64	898.26	461.	518.	0.864	27.32	1.900
CO-60	4693.66	1173.28	150.	5523.	9.206	2.95	1.928
CO-60	5331.27	1332.52	32.	4916.	8.193	2.93	2.161
Y-88	7347.42	1835.87	0.	339.	0.565	10.86	1.647s

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****						
Name	Code	Average Activity pCi/g	Energy keV	Peak Activity pCi/g	Code MDA Value pCi/g	COMMENTS

PB-210		2.1389E+05	46.52	2.139E+05	(P 1.008E+04 2.49E+00 G	
AM-241		2.0210E+04	59.54	2.021E+04	(P 7.460E+02 2.15E+00 G	
CD-109		2.1913E+05	88.03	2.191E+05	(1.130E+04 3.80E+00 G	
CO-57		7.6231E+03	122.07	7.623E+03	(6.782E+02 4.21E+00 G	
TE-123M		1.1768E+04	159.00	1.177E+04	@(P 3.913E+03 1.46E+01 G	

ORTEC g v - i (3263) Env32 G53W4.22 19-DEC-2017 10:58:20 Page 4
 American Radiation Services Spectrum name: ARS02071.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
CR-51	0.0000E+00	320.07	0.000E+00	&(	0.000E+00	4.51E+02	G
SN-113	5.4182E+04	391.69	5.418E+04	(P	8.700E+03	8.11E+00	G
SR-85	4.2923E+04	513.99	4.292E+04	% (	7.941E+04	5.63E+01	G
CS-137	3.4453E+04	661.66	3.445E+04	(	4.256E+02	1.33E+00	G
CO-60	4.0372E+04	1173.24	4.083E+04	(P	4.412E+02	1.48E+00	G
		1332.50	3.992E+04	(	2.360E+02	1.47E+00	G
Y-88	7.7225E+04	1836.01	8.017E+04	(P	1.744E+03	5.43E+00	G
		898.02	7.415E+04	(	1.470E+04	1.37E+01	G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
 ! - Peak is part of a multiplet and this area went negative during deconvolution.
 ? - Peak is too narrow.
 @ - Peak is too wide at FW25M, but ok at FWHM.
 % - Peak fails sensitivity test.
 \$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
 + - Peak activity higher than counting uncertainty range.
 - - Peak activity lower than counting uncertainty range.
 = - Peak outside analysis energy range.
 & - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
 P - Peakbackground subtraction
 } - Peak is too close to another for the activity to be found directly.

Nuclide Codes:

T - Thermal Neutron Activation
 F - Fast Neutron Activation
 I - Fission Product
 N - Naturally Occurring Isotope
 P - Photon Reaction
 C - Charged Particle Reaction
 M - No MDA Calculation

Peak Codes:

G - Gamma Ray
 X - X-Ray
 P - Positron Decay
 S - Single-Escape
 D - Double-Escape
 K - Key Line
 A - Not in Average

ORTEC g v - i (3263) Env32 G53W4.22 19-DEC-2017 10:58:20 Page 5
 American Radiation Services Spectrum name: ARS02071.An1

R - Coincidence Corrected C - Coincidence Peak
 H - Halflife limit exceeded

```

***** S U M M A R Y   O F   N U C L I D E S   I N   S A M P L E *****
      Time of Count   Time Corrected   Uncertainty   2 Sigma
Nuclide      Activity   Activity      Counting      Total      MDA
             pCi/g      pCi/g        pCi/g        pCi/g      pCi/g
-----
PB-210      2.0407E+05      2.1389E+05      1.0679E+04      2.3659E+04      1.008E+04
AM-241      2.0165E+04      2.0210E+04      8.6795E+02      1.8501E+03      7.460E+02
CD-109      9.8203E+04      2.1913E+05      1.6658E+04      2.4120E+04      1.130E+04
CO-57       2.1096E+03      7.6231E+03      6.4188E+02      8.2608E+02      6.782E+02
TE-123M#    6.3248E+02      1.1768E+04      3.4539E+03      3.5555E+03      3.913E+03
CR-51 #A    -1.9011E+02 >12 Halflives 1.7134E+03      1.7134E+03      2.883E+03
SN-113 #    2.5901E+03      5.4182E+04      8.8005E+03      9.6882E+03      8.700E+03
SR-85 #A    1.9266E+02      4.2923E+04      4.8325E+04      4.8401E+04      7.941E+04
CS-137      3.3376E+04      3.4453E+04      9.1916E+02      1.6735E+03      4.256E+02
CO-60       3.3662E+04      4.0372E+04      8.4023E+02      1.7146E+03      4.412E+02
Y-88        2.9031E+03      7.7225E+04      8.3947E+03      9.5242E+03      1.744E+03

```

- All peaks for activity calculation had bad shape.
 * - Activity omitted from total
 & - Activity omitted from total and all peaks had bad shape.
 < - MDA value printed.
 A - Activity printed, but activity < MDA.
 B - Activity < MDA and failed test.
 C - Area < Critical level.
 F - Failed fraction or key line test.
 H - Halflife limit exceeded

```

----- S U M M A R Y -----
Total Activity (    0.4 to 1998.7 keV)      3.977E+05 pCi/g
Total Decayed Activity (    0.4 to 1998.7 keV) 6.7885075E+05 pCi/g

```


Calibration Data from file: 2275-19-5 250mL tc poly 12-8-21.Clb

Energy Calibration Date: 12/8/2021 Time: 10:48:48 AM

Efficiency Calibration Date: 12/8/2021 Time: 11:58:07 AM

Calibration Description:

2275-19-5 250mL tc poly

12-8-21 EEC

Energy Calibration Fit

Energy = 0.1003 +0.250034*Channel -3.09474e-008*Channel**2

FWHM (ch) = 3.7306 +0.001192*Channel -3.52632e-008*Channel**2

Energy/FWHM Table

Channel	Energy(keV)	Fit(keV)	Delta	FWHM(keV)	Fit(keV)	Delta
186.13	46.52	46.64	-0.25%	0.99	0.99	-0.16%
238.01	59.54	59.61	-0.12%	0.98	1.00	-2.33%
351.84	88.03	88.07	-0.04%	1.03	1.04	-0.48%
487.75	122.07	122.05	0.02%	1.08	1.08	0.14%
635.45	159.00	158.97	0.02%	1.14	1.12	1.62%
1279.25	320.07	319.91	0.05%	1.32	1.30	1.91%
1565.92	391.69	391.56	0.03%	1.37	1.38	-0.23%
2055.65	513.99	513.95	0.01%	1.51	1.51	-0.14%
2646.90	661.66	661.70	-0.01%	1.66	1.66	-0.07%
3593.06	898.02	898.09	-0.01%	1.88	1.89	-0.32%
4694.85	1173.24	1173.29	-0.00%	2.12	2.14	-0.91%
5332.62	1332.50	1332.56	-0.00%	2.28	2.27	0.66%
7349.08	1836.01	1835.95	0.00%	2.64	2.64	0.04%

Efficiency Calibration Fit

Polynomial Uncertainty = 1.2536 %

Coefficients:

-0.502841 -4.041766 0.314910 -0.026798 0.000803 -0.000009

Efficiency Table

Energy	Efficiency	Fit	Delta
46.52	2.8835E-002	2.8708E-002	0.44%
59.54	3.9219E-002	3.9685E-002	-1.19%
88.03	5.4780E-002	5.3174E-002	2.93%
122.07	5.3339E-002	5.3962E-002	-1.17%
159.00	4.7614E-002	4.9045E-002	-3.00%
320.07	3.0994E-002	3.1532E-002	-1.73%
391.69	2.8452E-002	2.7422E-002	3.62%
513.99	2.3347E-002	2.2750E-002	2.56%
661.66	1.9865E-002	1.9120E-002	3.75%
898.02	1.4855E-002	1.5378E-002	-3.53%
1173.24	1.1951E-002	1.2497E-002	-4.57%
1332.50	1.0932E-002	1.1218E-002	-2.62%
1836.01	8.5589E-003	8.2192E-003	3.97%

Calibration Certificate Table

Isotope	Energy	Pct	Half-life	Activity	GPS	Error	Date & Time
Pb-210	46.52	4.00	7.45E+003	0.35	518.00	4.00%	11/1/2021 2:00:00 PM
Am-241	59.54	36.30	1.58E+005	0.03	467.40	3.00%	11/1/2021 2:00:00 PM
Cd-109	88.03	3.61	4.36E+002	0.32	429.16	3.00%	11/1/2021 2:00:00 PM
Co-57	122.07	85.60	2.72E+002	0.01	393.05	3.10%	11/1/2021 2:00:00 PM
Te-123M	159.00	83.50	1.20E+002	0.02	520.27	3.00%	11/1/2021 2:00:00 PM
Cr-51	320.07	9.83	2.77E+001	0.43	1558.86	3.00%	11/1/2021 2:00:00 PM
Sn-113	391.69	64.16	1.15E+002	0.06	1430.05	3.00%	11/1/2021 2:00:00 PM
Sr-85	513.99	99.28	6.47E+001	0.08	2829.59	3.00%	11/1/2021 2:00:00 PM
Cs-137	661.66	85.21	1.10E+004	0.05	1726.46	3.00%	11/1/2021 2:00:00 PM
Y-88	898.02	95.00	1.07E+002	0.12	4333.99	3.00%	11/1/2021 2:00:00 PM
Co-60	1173.24	99.90	1.93E+003	0.07	2409.99	3.00%	11/1/2021 2:00:00 PM
Co-60	1332.50	99.98	1.93E+003	0.07	2411.97	3.00%	11/1/2021 2:00:00 PM
Y-88	1836.01	99.35	1.07E+002	0.12	4532.45	3.00%	11/1/2021 2:00:00 PM

ORTEC g v - i (3263) Env32 G800W064 12/8/2021 12:02:20 PM
 AAA Spectrum name: 2275-19-5 250mL tc poly eft 12-8

Sample description
 2275-19-5 250mL tc poly

Spectrum Filename: C:\User\Calibrations\2021\2275-19-5 250mL tuna can
 \2275-19-5 250mL tc poly eft 12-8-21.An1

Acquisition information

Start time: 12/8/2021 8:41:24 AM
 Live time: 7200
 Real time: 7641
 Dead time: 5.77 %
 Detector ID: 21

Detector system

ARS06 MCB 133

Calibration

Filename: 2275-19-5 250mL tuna can calib 12-7-21.C
 1b
 2275-19-5 250mL tuna can
 12-7-21 EEC

Energy Calibration

Created: 12/7/2021 2:01:12 PM
 Zero offset: 0.115 keV
 Gain: 0.250 keV/channel
 Quadratic: $-3.130\text{E-}08 \text{ keV/channel}^2$

Efficiency Calibration

Created: 12/7/2021 2:13:04 PM
 Knee Energy: 150.00 keV
 Above the Knee: Quadratic Uncertainty = 1.43 %
 Log(Eff): $-1.559890\text{E}+00 + (-8.275593\text{E-}04*\text{Log}(E)) + (-5.657383\text{E-}02*\text{Log}(E)^2)$
 Below the Knee: Quadratic Uncertainty = 0.76 %
 Log(Eff): $-2.264008\text{E}+01 + (8.441602\text{E}+00*\text{Log}(E)) + (-9.021915\text{E-}01*\text{Log}(E)^2)$

Library Files

Main analysis library: northamericancal.Lib
 Library Match Width: 0.500
 Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G800W064
 Start channel: 10 (2.62keV)
 Stop channel: 8000 (1998.28keV)
 Peak rejection level: 40.000%
 Peak search sensitivity: 1
 Sample Size: $1.0000\text{E}+00 \pm 0.0000\text{E}+00\%$
 Activity scaling factor: $1.0000\text{E}+06 / (1.0000\text{E}+00 * 1.0000\text{E}+00) = 1.0000\text{E}+06$

ORTEC g v - i (3263) Env32 G800W064 12/8/2021 12:02:20 PM
 AAA Spectrum name: 2275-19-5 250mL tc poly eft 12-8

Detection limit method: Reg. Guide 4.16 Method
 Random error: 1.0000000E+00
 Systematic error: 1.0000000E+00
 Fraction Limit: 0.000%
 Background width: best method (based on spectrum).
 Half lives decay limit: 12.000
 Activity range factor: 2.000
 Min. step backg. energy 0.000
 Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2021 2:00:00 PM
Decay during acquisition:	NO	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	cal solids.Pbc 11/15/2021 8:26:58 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 0 cutoff: 0.00E+00 %
 Energy Calibration
 Normalized diff: 0.0429

***** S U M M A R Y O F P E A K S I N R A N G E *****								
Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
12.13	5663.	3.64	1.20	7.061E-04				
22.17	16802.	1.77	0.96	5.800E-03				
24.94	17709.	1.84	0.96	8.021E-03				
27.61	7048.	4.00	0.96	1.039E-02				
32.12	5970.	4.70	0.97	1.478E-02				
46.65	110523.	0.58	0.98	2.949E-02	46.52	4.000	3.544E+05	PB210
59.64	135324.	0.49	0.98	4.044E-02	59.54	36.300	3.466E+04	AM241
83.62	4252.	8.91	1.03	5.229E-02				
88.08	158766.	0.34	1.03	5.341E-02	88.03	3.610	3.277E+05	CD109
122.07	135123.	0.51	1.07	5.459E-02	122.07	85.600	1.192E+04	CO57
136.47	15910.	2.82	1.08	5.263E-02				
158.97	143930.	0.48	1.14	4.892E-02	159.00	83.500	1.637E+04	TE123M
254.95	9504.	4.18	1.12	3.683E-02				
310.06	632.	38.29	1.28	3.249E-02				
315.37	758.	37.47	1.29	3.214E-02				
319.93	138081.	0.35	1.29	3.184E-02	320.07	9.830	4.158E+05	CR51
391.55	232986.	0.29	1.37	2.784E-02	391.69	64.160	6.112E+04	SN113
513.92	318199.	0.23	1.51	2.307E-02	513.99	99.280	7.734E+04	SR85
526.94	691.	39.15	0.39	2.271E-02				
526.94	691.	39.15	0.39	2.271E-02				
661.67	245798.	0.28	1.66	1.922E-02	661.66	85.210	5.646E+04	CS137

ORTEC g v - i (3263) Env32 G800W064 12/8/2021 12:02:20 PM
 AAA Spectrum name: 2275-19-5 250mL tc poly eft 12-8

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
771.42	684.	38.38	5.12	1.715E-02				
813.77	4069.	6.66	2.61	1.647E-02				
821.45	779.	34.99	2.03	1.635E-02				
859.86	615.	23.26	1.85	1.579E-02				
863.48	576.	30.01	1.85	1.574E-02				
866.03	504.	35.30	1.85	1.570E-02				
868.40	637.	27.35	1.85	1.567E-02				
872.38	376.	38.42	1.86	1.562E-02				
898.04	363140.	0.20	1.88	1.527E-02	898.02	95.000	1.193E+05	Y88
1075.46	618.	39.74	0.33	1.327E-02				
1173.22	216388.	0.26	2.12	1.238E-02	1173.24	99.900	6.655E+04	CO60
1324.98	6318.	2.77	2.26	1.122E-02				
1332.64	185401.	0.25	2.26	1.117E-02	1332.50	99.982	6.314E+04	CO60
1581.39	639.	39.48	1.30	9.702E-03				
1688.68	437.	34.67	2.41	9.181E-03				
1825.90	450.	21.04	2.63	8.595E-03				
1836.03	217266.	0.23	2.64	8.555E-03	1836.01	99.350	1.219E+05	Y88
1935.80	192.	32.57	0.24	8.174E-03				
1993.79	124.	28.70	0.26	7.971E-03				

***** UNIDENTIFIED PEAK SUMMARY *****

Peak Centroid Channel	Background Energy	Net Area Counts	Efficiency * Area	Uncert 2 Sigma	FWHM %	Suspected Nuclide
48.04	11.94	16706.	5663. 8.019E+06	7.27	1.196	- s
88.20	22.13	35971.	16802. 2.897E+06	3.55	0.957	- D
99.29	24.90	44106.	17709. 2.208E+06	3.68	0.961	- sD
109.95	27.57	36226.	7048. 6.781E+05	8.00	0.964	- D
128.03	32.09	36439.	5970. 4.039E+05	9.41	0.969	- sD
334.18	83.62	64670.	4330. 8.281E+04	16.89	1.029	- sD
545.39	136.47	68892.	15910. 3.023E+05	5.65	1.083	-
1019.39	254.96	52924.	9504. 2.581E+05	8.36	1.120	-
1239.88	310.20	29003.	632. 1.947E+04	76.58	1.284	- sD
1260.44	315.34	42080.	1094. 3.403E+04	53.39	1.290	- sD
2107.68	525.32	22649.	691. 3.043E+04	78.29	0.388	- s
3086.13	771.49	18419.	684. 3.987E+04	76.76	5.124	- s
3255.69	813.64	18259.	4069. 2.471E+05	13.32	2.605	- s
3286.44	821.55	18847.	779. 4.764E+04	69.98	2.032	-
3440.17	859.92	9918.	615. 3.893E+04	46.52	1.845	- sD
3454.68	863.54	14668.	576. 3.662E+04	60.01	1.848	- sD
3464.87	866.09	15554.	504. 3.208E+04	70.59	1.851	- sD
3474.35	868.46	14875.	637. 4.067E+04	54.70	1.853	- sD
3490.31	872.45	10267.	376. 2.410E+04	76.83	1.857	- sD
4303.33	1075.46	15324.	618. 4.661E+04	79.47	0.334	- s
5302.49	1324.83	12128.	6315. 5.627E+05	5.54	2.255	- D
6329.59	1580.96	13709.	639. 6.588E+04	78.97	1.300	- s

ORTEC g v - i (3263) Env32 G800W064 12/8/2021 12:02:20 PM

AAA

Spectrum name: 2275-19-5 250mL tc poly eft 12-8

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected
6759.43	1688.56	5490.	437.	4.758E+04	69.34	2.406	s
7309.20	1825.60	4258.	450.-	2.676E+04	42.08	2.631	1D
7749.60	1936.20	951.	192.	2.347E+04	65.13	0.241	s
7982.01	1993.79	418.	124.	1.560E+04	57.39	0.262	s

s - Peak fails shape tests.
D - Peak area deconvoluted.
L - Peak written from unknown list.
C - Area < Critical level.

This section based on library: northamericancal.Lib

***** I D E N T I F I E D P E A K S U M M A R Y *****
Nuclide Peak Centroid Background Net Area Intensity Uncert FWHM
Channel Energy Counts Counts Cts/Sec 2 Sigma % keV

PB-210	186.14	46.65	100222.	110523.	15.350	1.16	0.981
AM-241	238.08	59.64	97121.	135324.	18.795	0.98	0.980
CD-109	351.66	88.03	69978.	158766.	22.051	0.69	1.034D
CO-57	487.81	122.07	101727.	135123.	18.767	1.02	1.074
TE-123M	635.42	158.97	99610.	143930.	19.990	0.97	1.135
CR-51	1279.92	320.07	46640.	138192.	19.193	0.70	1.295D
SN-113	1565.91	391.55	55226.	232986.	32.359	0.58	1.374
SR-85	2055.60	513.92	53445.	318199.	44.194	0.47	1.507
CS-137	2646.89	661.67	44955.	245798.	34.139	0.55	1.659
Y-88	3593.01	898.04	34881.	363140.	50.436	0.41	1.883
CO-60	4694.77	1173.22	19458.	216388.	30.054	0.53	2.119
CO-60	5332.66	1332.50	18596.	185401.	25.750	0.51	2.261D
Y-88	7348.65	1835.74	6022.	237918.	33.044	0.44	2.669s

s - Peak fails shape tests.
D - Peak area deconvoluted.
A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****
- Nuclide - Average ----- Peak -----
Name Code Activity Energy Activity Code MDA Value
pCi/g keV pCi/g pCi/g COMMENTS

PB-210		3.5438E+05					7.45E+03
			46.52	3.544E+05	(	4.739E+03	5.80E-01 4.00E+00 G
AM-241		3.4662E+04					1.58E+05
			59.54	3.466E+04	(	3.727E+02	4.88E-01 3.63E+01 G

ORTEC g v - i (3263) Env32 G800W064 12/8/2021 12:02:20 PM

AAA Spectrum name: 2275-19-5 250mL tc poly eft 12-8

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
CD-109	3.2774E+05	88.03	3.277E+05	(	2.550E+03	3.44E-01	4.36E+02 3.61E+00 G
CO-57	1.1919E+04	122.07	1.192E+04	(	1.313E+02	5.08E-01	2.72E+02 8.56E+01 G
TE-123M	1.6368E+04	159.00	1.637E+04	(	1.676E+02	4.83E-01	1.20E+02 8.35E+01 G
CR-51	4.1610E+05	320.07	4.161E+05	(	3.038E+03	3.48E-01	2.77E+01 9.83E+00 G
SN-113	6.1115E+04	391.69	6.112E+04	(	2.880E+02	2.91E-01	1.15E+02 6.42E+01 G
SR-85	7.7339E+04	513.99	7.734E+04	(	2.625E+02	2.35E-01	6.47E+01 9.93E+01 G
CS-137	5.6460E+04	661.66	5.646E+04	(	2.276E+02	2.75E-01	1.10E+04 8.52E+01 G
CO-60	6.6547E+04	1173.24 1332.50	6.655E+04 6.314E+04	(-	2.007E+02 2.173E+02	2.63E-01 2.54E-01	1.93E+03 9.99E+01 G 1.00E+02 G
Y-88	1.3347E+05	1836.01 898.02	1.335E+05 1.193E+05	@(-	2.044E+02 2.868E+02	2.21E-01 2.03E-01	1.07E+02 9.93E+01 G 9.50E+01 G

(- This peak used in the nuclide activity average.

- * - Peak is too wide, but only one peak in library.
- ! - Peak is part of a multiplet and this area went negative during deconvolution.
- ? - Peak is too narrow.
- @ - Peak is too wide at FW25M, but ok at FWHM.
- % - Peak fails sensitivity test.
- \$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
- + - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
- = - Peak outside analysis energy range.
- & - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
- P - Peakbackground subtraction
- } - Peak is too close to another for the activity

ORTEC g v - i (3263) Env32 G800W064 12/8/2021 12:02:20 PM
 AAA Spectrum name: 2275-19-5 250mL tc poly eft 12-8

to be found directly.

Nuclide Codes:	Peak Codes:
T - Thermal Neutron Activation	G - Gamma Ray
F - Fast Neutron Activation	X - X-Ray
I - Fission Product	P - Positron Decay
N - Naturally Occurring Isotope	S - Single-Escape
P - Photon Reaction	D - Double-Escape
C - Charged Particle Reaction	K - Key Line
M - No MDA Calculation	A - Not in Average
R - Coincidence Corrected	C - Coincidence Peak
H - Halflife limit exceeded	

***** D I S C A R D E D I S O T O P E P E A K S *****

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma	Activity %
---------	-----------------	-------------------	-----------------	-------------------	----------------	------------

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****					
Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
PB-210	3.5317E+05	3.5438E+05	4.1122E+03	3.1701E+04	4.739E+03
AM-241	3.4656E+04	3.4662E+04	3.3841E+02	2.3989E+03	3.727E+02
CD-109	3.0913E+05	3.2774E+05	2.2565E+03	2.4728E+04	2.550E+03
CO-57	1.0855E+04	1.1919E+04	1.2106E+02	7.9895E+02	1.313E+02
TE-123M	1.3228E+04	1.6368E+04	1.5800E+02	1.3121E+03	1.676E+02
CR-51	1.6577E+05	4.1610E+05	2.8973E+03	2.6313E+04	3.038E+03
SN-113	4.8973E+04	6.1115E+04	3.5559E+02	4.4179E+03	2.880E+02
SR-85	5.2163E+04	7.7339E+04	3.6335E+02	4.9185E+03	2.625E+02
CS-137	5.6329E+04	5.6460E+04	3.1059E+02	2.3140E+03	2.276E+02
CO-60	6.5672E+04	6.6547E+04	3.4978E+02	2.4811E+03	2.007E+02
Y-88	1.0510E+05	1.3347E+05	5.9058E+02	7.1436E+03	2.044E+02

< - MDA value printed.

A - Activity printed, but activity < MDA.

B - Activity < MDA and failed test.

C - Area < Critical level.

F - Failed fraction or key line test.

H - Halflife limit exceeded

----- S U M M A R Y -----		
Total Activity (	2.6 to 1998.3 keV)	1.215E+06 pCi/g
Total Decayed Activity (	2.6 to 1998.3 keV)	1.5561082E+06 pCi/g

Analyzed by: _____
 Countroom

Reviewed by: _____
 Supervisor

Laboratory: AAA

ORTEC g v - i (3263) Env32 G800W064 12/8/2021 12:13:33 PM
 AAA Spectrum name: ARS06690.An1

Sample description

Batch ID: Cal Ver
 SDG ID: 2275-19-5 Tech: EEC

Spectrum Filename: C:\User\ARS06690.An1

Acquisition information

Start time: 12/8/2021 12:02:49 PM
 Live time: 600
 Real time: 637
 Dead time: 5.78 %
 Detector ID: 21

Detector system

ARS06 MCB 133

Calibration

Filename: 2275-19-5 250mL tuna can calib 12-7-21.C
 lb

2275-19-5 250mL tuna can
 12-7-21 EEC

Energy Calibration

Created: 12/7/2021 2:01:12 PM
 Zero offset: 0.115 keV
 Gain: 0.250 keV/channel
 Quadratic: $-3.130E-08 \text{ keV/channel}^2$

Efficiency Calibration

Created: 12/7/2021 2:13:04 PM
 Knee Energy: 150.00 keV
 Above the Knee: Quadratic Uncertainty = 1.43 %
 Log(Eff): $-1.559890E+00 + (-8.275593E-04 * \text{Log}(E)) + (-5.657383E-02 * \text{Log}(E)^2)$
 Below the Knee: Quadratic Uncertainty = 0.76 %
 Log(Eff): $-2.264008E+01 + (8.441602E+00 * \text{Log}(E)) + (-9.021915E-01 * \text{Log}(E)^2)$

Library Files

Main analysis library: northamericancal.Lib
 Library Match Width: 0.500
 Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G800W064
 Start channel: 10 (2.62keV)
 Stop channel: 8000 (1998.28keV)
 Peak rejection level: 40.000%
 Peak search sensitivity: 1
 Sample Size: 1.0000E+00 +/- 0.000E+00%
 Activity scaling factor: $1.0000E+06 / (1.0000E+00 * 1.0000E+00) = 1.0000E+06$
 Detection limit method: Reg. Guide 4.16 Method

ORTEC g v - i (3263) Env32 G800W064 12/8/2021 12:13:33 PM
 AAA Spectrum name: ARS06690.An1

Random error: 1.0000000E+00
 Systematic error: 1.0000000E+00
 Fraction Limit: 0.000%
 Background width: best method (based on spectrum).
 Half lives decay limit: 12.000
 Activity range factor: 2.000
 Min. step backg. energy 0.000
 Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	11/1/2021 2:00:00 PM
Decay during acquisition:	NO	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	cal solids.Pbc 11/15/2021 8:26:58 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 0 cutoff: 0.00E+00 %
 Energy Calibration
 Normalized diff: 0.0387

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
11.93	1021.	5.01	0.95	7.202E-04				
15.19	496.	14.68	0.95	1.768E-03				
22.19	1622.	5.41	0.96	5.812E-03				
24.87	1733.	5.21	0.96	7.952E-03				
27.55	722.	11.74	0.96	1.034E-02				
32.15	593.	13.79	0.97	1.480E-02				
46.67	9431.	1.91	1.00	2.948E-02	46.52	4.000	3.629E+05	PB210
59.66	11243.	1.70	0.99	4.046E-02	59.54	36.300	3.456E+04	AM241
88.08	13585.	1.52	1.03	5.342E-02	88.03	3.610	3.366E+05	CD109
122.07	11216.	1.71	1.09	5.459E-02	122.07	85.600	1.188E+04	CO57
136.39	1217.	10.74	1.10	5.264E-02				
158.98	12070.	1.69	1.16	4.892E-02	159.00	83.500	1.648E+04	TE123M
254.89	851.	13.29	1.13	3.681E-02				
319.91	12036.	1.55	1.35	3.185E-02	320.07	9.830	4.364E+05	CR51
391.54	19361.	0.97	1.38	2.784E-02	391.69	64.160	6.099E+04	SN113
513.93	26520.	0.81	1.52	2.307E-02	513.99	99.280	7.746E+04	SR85
661.69	20363.	0.92	1.68	1.922E-02	661.66	85.210	5.613E+04	CS137
813.52	387.	18.96	1.86	1.647E-02				
898.04	30319.	0.68	1.86	1.527E-02	898.02	95.000	1.196E+05	Y88
1173.21	17963.	0.93	2.05	1.238E-02	1173.24	99.900	6.629E+04	CO60
1325.01	479.	10.24	2.26	1.122E-02				
1332.66	15443.	0.89	2.26	1.117E-02	1332.50	99.982	6.312E+04	CO60

ORTEC g v - i (3263) Env32 G800W064 12/8/2021 12:13:33 PM
 AAA Spectrum name: ARS06690.An1

pk energy	area	uncert	fw hm	corr	nuclide	brnch.	act.	nuc
1742.75	103.	27.90	2.18	8.940E-03				
1835.75	19708.	0.79	2.74	8.553E-03	1836.01	99.350	1.328E+05	Y88
1947.41	84.	22.67	0.45	8.134E-03				

***** U N I D E N T I F I E D P E A K S U M M A R Y *****

Peak Centroid	Background	Net Area	Efficiency	Uncert	FWHM	Suspected
Channel	Energy	Counts	* Area	2 Sigma %	keV	Nuclide
47.27	11.99	800.	1021.	1.418E+06	10.02	0.945 - D
60.28	15.25	2409.	496.	2.809E+05	29.37	0.949 - sD
88.31	22.15	3037.	1622.	2.791E+05	10.81	0.957 - D
99.00	24.82	3202.	1733.	2.179E+05	10.41	0.961 - sD
109.74	27.51	3234.	722.	6.987E+04	23.48	0.964 - sD
128.14	32.10	3047.	593.	4.006E+04	27.58	0.969 - sD
545.11	136.41	5879.	1217.	2.313E+04	21.48	1.103 -
1019.15	255.14	4262.	851.	2.311E+04	26.59	1.128 -
3254.67	813.46	1353.	387.	2.351E+04	37.92	1.861 -
5302.57	1324.83	964.	478.	4.263E+04	20.50	2.255 - D
6976.05	1742.70	173.	103.	1.154E+04	55.80	2.182 - s
7796.14	1947.41	38.	84.	1.033E+04	45.34	0.450 - s

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 L - Peak written from unknown list.
 C - Area < Critical level.

 This section based on library: northamericancal.Lib

***** I D E N T I F I E D P E A K S U M M A R Y *****

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma %	FWHM keV
PB-210	186.20	46.67	7887.	9431.	15.718	3.81	0.998s
AM-241	238.15	59.66	8104.	11243.	18.738	3.39	0.993
CD-109	351.84	88.08	9020.	13585.	22.642	3.03	1.034
CO-57	487.81	122.07	7977.	11216.	18.693	3.42	1.091
TE-123M	635.45	158.98	8408.	12070.	20.116	3.38	1.155
CR-51	1279.27	319.91	5812.	12036.	20.061	3.10	1.346s
SN-113	1565.86	391.54	4183.	19361.	32.268	1.94	1.377
SR-85	2055.60	513.93	4336.	26520.	44.199	1.62	1.520
CS-137	2646.94	661.69	3422.	20363.	33.938	1.84	1.676
Y-88	3593.03	898.04	2603.	30319.	50.532	1.36	1.861
CO-60	4694.76	1173.21	1705.	17963.	29.938	1.86	2.054
CO-60	5332.66	1332.50	1675.	15443.	25.739	1.78	2.261D
Y-88	7348.69	1835.75	624.	19708.	32.847	1.58	2.738s

ORTEC g v - i (3263) Env32 G800W064 12/8/2021 12:13:33 PM
 AAA Spectrum name: ARS06690.An1

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 A Derived peak area.

```

***** S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide - Average ----- Peak -----
Name   Code   Activity   Energy   Activity Code MDA Value
      pCi/g      keV      pCi/g      pCi/g      COMMENTS
-----
PB-210      3.6289E+05      46.52 3.629E+05 @ ( 1.603E+04 1.91E+00 4.00E+00 G
                                     7.45E+03
AM-241      3.4557E+04      59.54 3.456E+04 ( 1.298E+03 1.70E+00 3.63E+01 G
                                     1.58E+05
CD-109      3.3660E+05      88.03 3.366E+05 ( 1.103E+04 1.52E+00 3.61E+00 G
                                     4.36E+02
CO-57      1.1877E+04     122.07 1.188E+04 ( 4.436E+02 1.71E+00 8.56E+01 G
                                     2.72E+02
TE-123M     1.6484E+04     159.00 1.648E+04 ( 5.873E+02 1.69E+00 8.35E+01 G
                                     1.20E+02
CR-51      4.3643E+05     320.07 4.364E+05 @ ( 1.298E+04 1.55E+00 9.83E+00 G
                                     2.77E+01
SN-113      6.0995E+04     391.69 6.099E+04 ( 9.581E+02 9.70E-01 6.42E+01 G
                                     1.15E+02
SR-85      7.7464E+04     513.99 7.746E+04 ( 9.043E+02 8.09E-01 9.93E+01 G
                                     6.47E+01
CS-137      5.6129E+04     661.66 5.613E+04 ( 7.589E+02 9.20E-01 8.52E+01 G
                                     1.10E+04
CO-60      6.6294E+04     1173.24 6.629E+04 ( 7.202E+02 9.32E-01 9.99E+01 G
                                     1.93E+03
                                     1332.50 6.312E+04 - 7.904E+02 8.88E-01 1.00E+02 G
Y-88      1.3280E+05     1836.01 1.328E+05 @ ( 8.024E+02 7.90E-01 9.93E+01 G
                                     898.02 1.196E+05 - 9.489E+02 6.82E-01 9.50E+01 G
( - This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
! - Peak is part of a multiplet and this area went

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ORTEC g v - i (3263) Env32 G800W064 12/8/2021 12:13:33 PM
 AAA Spectrum name: ARS06690.An1

negative during deconvolution.

- ? - Peak is too narrow.
- @ - Peak is too wide at FW25M, but ok at FWHM.
- % - Peak fails sensitivity test.
- \$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
- + - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
- = - Peak outside analysis energy range.
- & - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
- P - Peakbackground subtraction
- } - Peak is too close to another for the activity to be found directly.

Nuclide Codes:

T - Thermal Neutron Activation
 F - Fast Neutron Activation
 I - Fission Product
 N - Naturally Occurring Isotope
 P - Photon Reaction
 C - Charged Particle Reaction
 M - No MDA Calculation
 R - Coincidence Corrected
 H - Halflife limit exceeded

Peak Codes:

G - Gamma Ray
 X - X-Ray
 P - Positron Decay
 S - Single-Escape
 D - Double-Escape
 K - Key Line
 A - Not in Average
 C - Coincidence Peak

***** D I S C A R D E D I S O T O P E P E A K S *****
 Nuclide Centroid Background Net Area Intensity Uncert Activity
 Energy Counts Counts Cts/Sec 2 Sigma %

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N				S A M P L E *****	
Time of Count		Time Corrected		2 Sigma	
Nuclide	Activity	Activity	Counting	Total	MDA
	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g
PB-210 #	3.6164E+05	3.6289E+05	1.3831E+04	3.5033E+04	1.603E+04
AM-241	3.4552E+04	3.4557E+04	1.1723E+03	2.6421E+03	1.298E+03
CD-109	3.1741E+05	3.3660E+05	1.0210E+04	2.7273E+04	1.103E+04
CO-57	1.0812E+04	1.1877E+04	4.0595E+02	8.8543E+02	4.436E+02
TE-123M	1.3311E+04	1.6484E+04	5.5642E+02	1.4250E+03	5.873E+02
CR-51 #	1.7326E+05	4.3643E+05	1.3509E+04	3.0577E+04	1.298E+04
SN-113	4.8834E+04	6.0995E+04	1.1831E+03	4.5513E+03	9.581E+02
SR-85	5.2168E+04	7.7464E+04	1.2534E+03	5.0703E+03	9.043E+02
CS-137	5.5998E+04	5.6129E+04	1.0325E+03	2.5026E+03	7.589E+02
CO-60	6.5419E+04	6.6294E+04	1.2356E+03	2.7412E+03	7.202E+02
Y-88	1.0447E+05	1.3280E+05	2.0991E+03	7.3876E+03	8.024E+02

ORTEC g v - i (3263) Env32 G800W064 12/8/2021 12:13:33 PM
AAA Spectrum name: ARS06690.An1

- All peaks for activity calculation had bad shape.
* - Activity omitted from total
& - Activity omitted from total and all peaks had bad shape.
< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

S U M M A R Y

Total Activity (2.6 to 1998.3 keV) 1.238E+06 pCi/g
Total Decayed Activity (2.6 to 1998.3 keV) 1.5925074E+06 pCi/g

Analyzed by: _____
Countroom

Reviewed by: _____
Supervisor

Laboratory: AAA

ORTEC g v - i (3263) Env32 G800W064 12/8/2021 1:22:20 PM
 AAA Spectrum name: ARS06694.An1

Sample description

Batch ID: Calibration Verification
 SDG ID: 2079-79-6 Tech: EEC

Spectrum Filename: C:\User\ARS06694.An1

Acquisition information

Start time: 12/8/2021 1:12:02 PM
 Live time: 600
 Real time: 609
 Dead time: 1.48 %
 Detector ID: 21

Detector system

ARS06 MCB 133

Calibration

Filename: 2275-19-5 250mL tuna can calib 12-7-21.C
 lb

2275-19-5 250mL tuna can
 12-7-21 EEC

Energy Calibration

Created: 12/7/2021 2:01:12 PM
 Zero offset: 0.115 keV
 Gain: 0.250 keV/channel
 Quadratic: $-3.130\text{E-}08 \text{ keV/channel}^2$

Efficiency Calibration

Created: 12/7/2021 2:13:04 PM
 Knee Energy: 150.00 keV
 Above the Knee: Quadratic Uncertainty = 1.43 %
 Log(Eff): $-1.559890\text{E}+00 + (-8.275593\text{E-}04 * \text{Log}(E)) + (-5.657383\text{E-}02 * \text{Log}(E)^2)$
 Below the Knee: Quadratic Uncertainty = 0.76 %
 Log(Eff): $-2.264008\text{E}+01 + (8.441602\text{E}+00 * \text{Log}(E)) + (-9.021915\text{E-}01 * \text{Log}(E)^2)$

Library Files

Main analysis library: northamericancal.Lib
 Library Match Width: 0.500
 Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G800W064
 Start channel: 10 (2.62keV)
 Stop channel: 8000 (1998.28keV)
 Peak rejection level: 40.000%
 Peak search sensitivity: 1
 Sample Size: $1.0000\text{E}+00 \pm 0.0000\text{E}+00\%$
 Activity scaling factor: $1.0000\text{E}+06 / (1.0000\text{E}+00 * 1.0000\text{E}+00) = 1.0000\text{E}+06$
 Detection limit method: Reg. Guide 4.16 Method

ORTEC g v - i (3263) Env32 G800W064 12/8/2021 1:22:20 PM
 AAA Spectrum name: ARS06694.An1

Random error: 1.0000000E+00
 Systematic error: 1.0000000E+00
 Fraction Limit: 0.000%
 Background width: best method (based on spectrum).
 Half lives decay limit: 12.000
 Activity range factor: 2.000
 Min. step backg. energy 0.000
 Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	10/1/2019 2:00:00 PM
Decay during acquisition:	NO	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	cal solids.Pbc 11/15/2021 8:26:58 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 0 cutoff: 0.00E+00 %

Energy Calibration
 Normalized diff: 0.0980

***** S U M M A R Y O F P E A K S I N R A N G E *****									
Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc	
11.71	118.	19.86	0.95	6.211E-04					
12.85	114.	25.29	0.95	8.993E-04					
22.19	368.	10.25	0.96	5.830E-03					
25.21	317.	12.02	0.96	8.264E-03					
32.35	323.	11.70	0.97	1.508E-02					
36.22	208.	21.13	0.97	1.904E-02					
46.59	5808.	1.96	0.89	2.943E-02	46.52	4.000	2.399E+05	PB210	
59.55	7060.	1.64	0.90	4.039E-02	59.54	36.300	2.177E+04	AM241	
87.98	2923.	2.65	1.01	5.339E-02	88.03	3.610	2.432E+05	CD109	
122.03	1190.	6.11	1.01	5.460E-02	122.07	85.600	8.763E+03	CO57	
136.33	237.	20.11	1.51	5.266E-02					
391.46	107.	27.43	1.10	2.785E-02	391.69	64.160	3.306E+04	SN113	
661.60	12931.	0.95	1.56	1.922E-02	661.66	85.210	3.739E+04	CS137	
677.30	81.	34.86	0.42	1.889E-02					
897.47	189.	21.87	1.54	1.528E-02	898.02	95.000	1.054E+05	Y88	
1173.15	9007.	1.15	2.03	1.238E-02	1173.24	99.900	4.374E+04	CO60	
1332.40	8093.	1.17	2.06	1.117E-02	1332.50	99.982	4.352E+04	CO60	
1548.25	26.	27.74	3.15	9.872E-03					
1688.65	23.	25.72	0.36	9.181E-03					
1724.82	15.	25.82	0.31	9.019E-03					
1835.77	105.	10.69	2.56	8.555E-03	1836.01	99.350	1.000E+05	Y88	
1875.41	14.	35.75	0.42	8.407E-03					

ORTEC g v - i (3263) Env32 G800W064 12/8/2021 1:22:20 PM
 AAA Spectrum name: ARS06694.An1

pk	energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
***** U N I D E N T I F I E D P E A K S U M M A R Y *****									
Channel	Energy	Counts	Counts	* Area	2 Sigma	%	keV	Suspected	Nuclide
46.38	11.56	215.	118.	1.896E+05	39.73	0.945	-	sD	
50.93	12.70	357.	114.	1.264E+05	50.59	0.946	-	sD	
88.31	22.17	528.	368.	6.313E+04	20.51	0.957	-	D	
100.38	25.19	567.	317.	3.836E+04	24.03	0.961	-	D	
128.92	32.38	552.	323.	2.142E+04	23.41	0.969	-	D	
144.41	36.25	858.	208.	1.091E+04	42.25	0.974	-	sD	
544.85	136.30	786.	237.	4.509E+03	40.23	1.515	-	sM	
1565.56	391.43	356.	107.	4.956E+03	54.86	1.099	-	l	
2709.44	677.55	231.	81.	4.288E+03	69.71	0.421	-	s	
6196.81	1548.42	6.	26.	2.613E+03	55.48	3.152	-	s	
6759.28	1688.65	3.	23.	2.505E+03	51.44	0.363	-	s	
6904.20	1724.82	0.	15.	1.663E+03	51.64	0.312	-	s	
7507.59	1873.58	3.	14.	1.677E+03	71.50	0.419	-	s	

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 L - Peak written from unknown list.
 C - Area < Critical level.
 M - Peak is close to a library peak.

 This section based on library: northamericancal.Lib

***** I D E N T I F I E D P E A K S U M M A R Y *****							
Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma	FWHM % keV
PB-210	185.87	46.59	2552.	5808.	9.679	3.92	0.888
AM-241	237.71	59.55	2071.	7060.	11.767	3.29	0.903
CD-109	351.46	87.98	1105.	2923.	4.871	5.31	1.006
CO-57	487.65	122.03	1240.	1190.	1.984	12.21	1.015
CS-137	2646.60	661.60	550.	12931.	21.551	1.91	1.563
Y-88	3590.64	897.45	448.	191.	0.318	45.56	1.554
CO-60	4694.50	1173.15	320.	9007.	15.012	2.29	2.026
CO-60	5332.23	1332.40	130.	8093.	13.488	2.33	2.058
Y-88	7348.78	1835.77	4.	105.	0.175	21.39	2.559

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 A - Derived peak area.

ORTEC g v - i (3263) Env32 G800W064 12/8/2021 1:22:20 PM
 AAA Spectrum name: ARS06694.An1

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***** S U M M A R Y   O F   L I B R A R Y   P E A K   U S A G E   *****
- Nuclide - Average ----- Peak -----
Name   Code Activity      Energy   Activity Code MDA Value
      pCi/g      keV      pCi/g      pCi/g
-----
PB-210      2.3988E+05
              46.52 2.399E+05 ( 9.836E+03 1.96E+00 4.00E+00 G
              7.45E+03

AM-241      2.1774E+04
              59.54 2.177E+04 ( 6.623E+02 1.64E+00 3.63E+01 G
              1.58E+05

CD-109      2.4322E+05
              88.03 2.432E+05 ( 1.312E+04 2.65E+00 3.61E+00 G
              4.36E+02

CO-57      8.7631E+03
              122.07 8.763E+03 ( 1.228E+03 6.11E+00 8.56E+01 G
              2.72E+02

TE-123M     1.3896E+03
              159.00 1.390E+03 %( 1.866E+04 5.31E+02 8.35E+01 G
              1.20E+02

CR-51      -9.6583E+02
              320.07-9.658E+02 %( 2.118E+03 9.13E+01 9.83E+00 G
              2.77E+01

SN-113      1.2406E+04
              391.69 1.241E+04 %( 4.567E+04 1.59E+02 6.42E+01 G
              1.15E+02

SR-85      -8.2621E+01
              513.99-8.262E+01 %( 2.597E+02 1.41E+02 9.93E+01 G
              6.47E+01

CS-137      3.7392E+04
              661.66 3.739E+04 ( 3.240E+02 9.55E-01 8.52E+01 G
              1.10E+04

CO-60      4.3627E+04
              1173.24 4.374E+04 ( 4.178E+02 1.15E+00 9.99E+01 G
              1.93E+03
              1332.50 4.352E+04 ( 3.003E+02 1.17E+00 1.00E+02 G

Y-88      1.0326E+05
              1836.01 1.000E+05 ( 1.158E+04 1.07E+01 9.93E+01 G
              898.02 1.067E+05 ( 5.659E+04 2.28E+01 9.50E+01 G
  
```

(- This peak used in the nuclide activity average.

- * - Peak is too wide, but only one peak in library.
- ! - Peak is part of a multiplet and this area went negative during deconvolution.
- ? - Peak is too narrow.
- @ - Peak is too wide at FW25M, but ok at FWHM.

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 AAA Spectrum name: ARS06694.An1

% - Peak fails sensitivity test.
 \$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
 + - Peak activity higher than counting uncertainty range.
 - - Peak activity lower than counting uncertainty range.
 = - Peak outside analysis energy range.
 & - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
 P - Peakbackground subtraction
 } - Peak is too close to another for the activity to be found directly.

Nuclide Codes:

T - Thermal Neutron Activation
 F - Fast Neutron Activation
 I - Fission Product
 N - Naturally Occurring Isotope
 P - Photon Reaction
 C - Charged Particle Reaction
 M - No MDA Calculation
 R - Coincidence Corrected
 H - Half-life limit exceeded

Peak Codes:

G - Gamma Ray
 X - X-Ray
 P - Positron Decay
 S - Single-Escape
 D - Double-Escape
 K - Key Line
 A - Not in Average
 C - Coincidence Peak

***** DISCARDED ISOTOPE PEAKS *****

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma	Activity
---------	-----------------	-------------------	-----------------	-------------------	----------------	----------

P - Peakbackground subtraction

***** SUMMARY OF NUCLIDES IN *****				S A M P L E *****	
Nuclide	Time of Count	Time Corrected	Uncertainty	2 Sigma	MDA
	Activity pCi/g	Activity pCi/g	Counting pCi/g	Total pCi/g	pCi/g
PB-210	2.2270E+05	2.3988E+05	9.4023E+03	2.3262E+04	9.836E+03
AM-241	2.1698E+04	2.1774E+04	7.1610E+02	1.6548E+03	6.623E+02
CD-109	6.8291E+04	2.4322E+05	1.2910E+04	2.2374E+04	1.312E+04
CO-57	1.1474E+03	8.7631E+03	1.0700E+03	1.2174E+03	1.228E+03
TE-123M A	1.3602E+01	1.3896E+03	1.4763E+04	1.4763E+04	1.866E+04
CR-51 #A	-9.6583E+02	>12 Halflives	1.7629E+03	1.7639E+03	2.118E+03
SN-113 #A	1.0089E+02	1.2406E+04	3.9469E+04	3.9479E+04	4.567E+04
SR-85 #A	-8.2621E+01	>12 Halflives	2.3299E+02	2.3305E+02	2.597E+02
CS-137	3.5559E+04	3.7392E+04	7.1403E+02	1.6781E+03	3.240E+02
CO-60	3.2721E+04	4.3627E+04	7.1286E+02	1.7610E+03	4.178E+02
Y-88	5.7409E+02	1.0326E+05	2.2082E+04	2.2759E+04	1.158E+04

- All peaks for activity calculation had bad shape.
 * - Activity omitted from total
 & - Activity omitted from total and all peaks had bad shape.

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AAA Spectrum name: ARS06694.An1

< - MDA value printed.
A - Activity printed, but activity < MDA.
B - Activity < MDA and failed test.
C - Area < Critical level.
F - Failed fraction or key line test.
H - Halflife limit exceeded

----- S U M M A R Y -----

Total Activity (2.6 to 1998.3 keV) 3.827E+05 pCi/g
Total Decayed Activity (2.6 to 1998.3 keV) 6.9791431E+05 pCi/g

Analyzed by: _____
Countroom

Reviewed by: _____
Supervisor

Laboratory: AAA



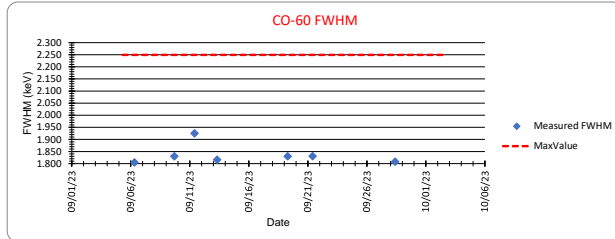
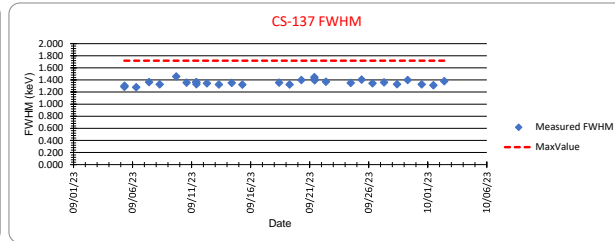
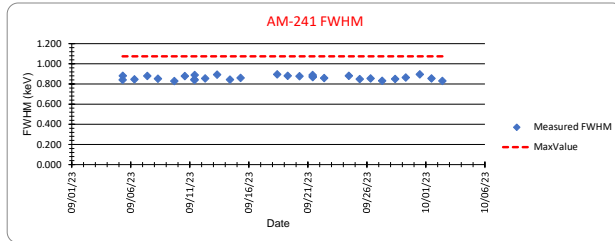
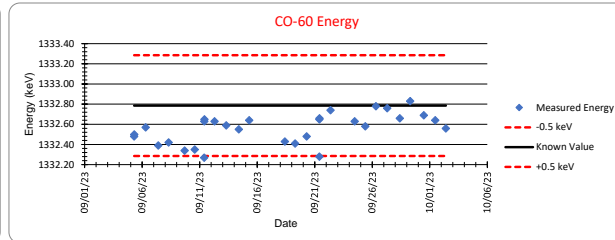
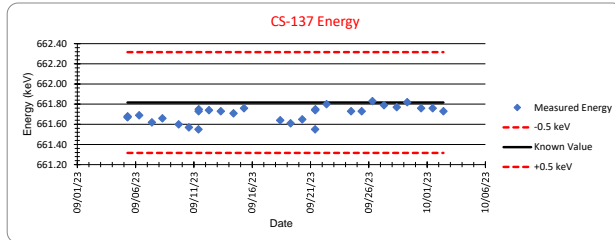
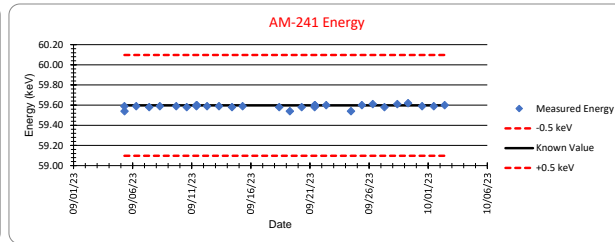
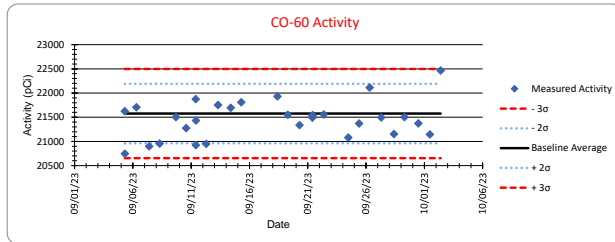
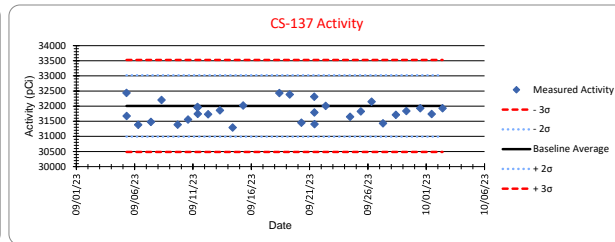
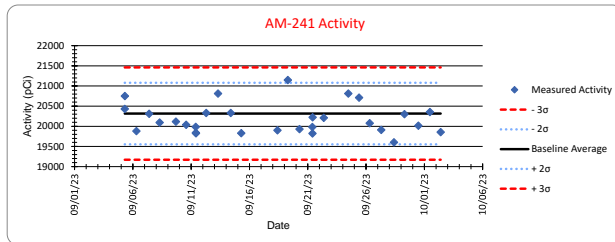
ARS Aleut Analytical, LLC Analytical Reports

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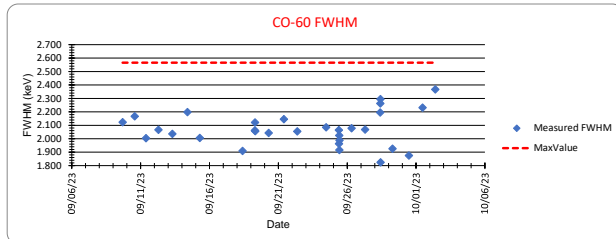
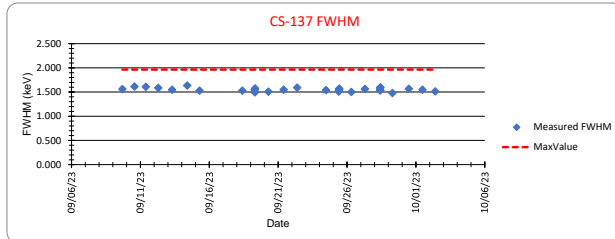
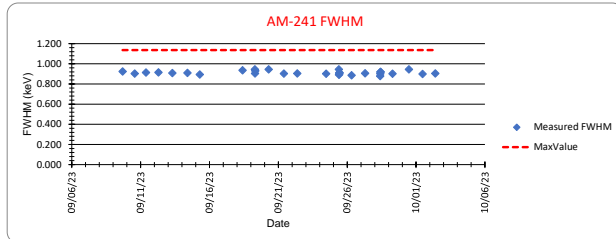
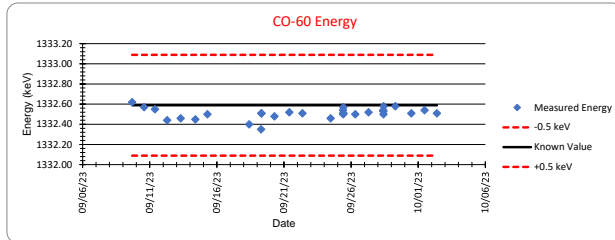
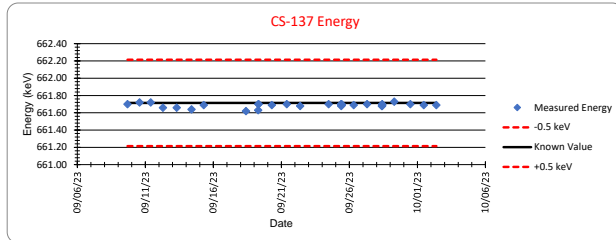
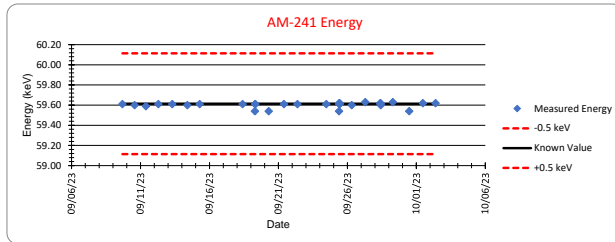
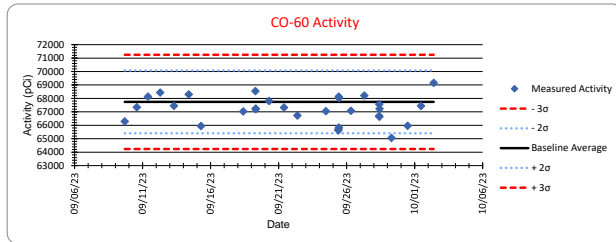
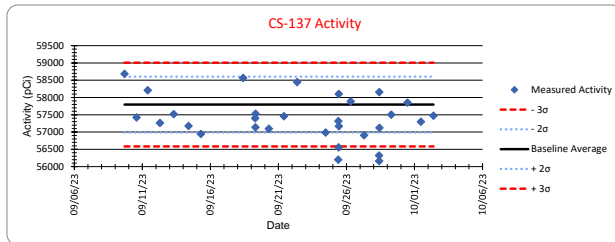
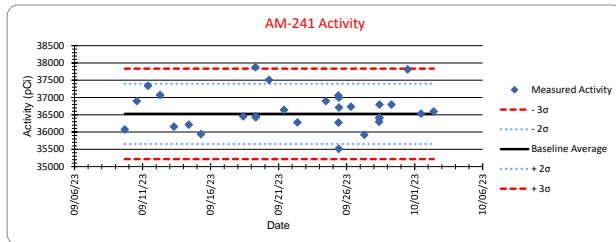
GES-AIS, LLC

Gamma Spec - CCV

Detector: ARS03				Calibration Verification								CalVer: 1595-98-4		
Acceptable performance rules: during baseline development - Energy $\leq \pm 0.5$ keV of known, Activity $\leq \pm 5\%$ of known, FWHM $\leq 125\%$ of known; after baseline development - Energy $\leq \pm 0.5$ keV of known, Activity $\leq \pm 3\sigma$, FWHM $\leq 125\%$ of known.														
Am-241				Cs-137				Co-60						
Max FWHM/Known Act		1.074	22747.75	Max FWHM/Known Act		1.718	35450.45	Max FWHM/Known Act		2.249	42792.79			
Average		59.598	0.860	20316	Average		661.816	1.375	32006	Average		1332.786	1.800	21576
Std Deviation		0.022	381.69	Std Deviation		0.027	507.09	Std Deviation		0.102	307.27			
Analysis Date	Energy keV	FWHM keV	Activity pCi	Analysis Date	Energy keV	FWHM keV	Activity pCi	Analysis Date	Energy keV	FWHM keV	Activity pCi			
09/05/2023	59.59	0.840	20430	09/05/2023	661.67	1.285	32439	09/05/2023	1332.48	1.719	21625			
09/05/2023	59.54	0.881	20749	09/05/2023	661.68	1.302	31674	09/05/2023	1332.50	1.632	20747			
09/06/2023	59.59	0.845	19880	09/06/2023	661.69	1.279	31383	09/06/2023	1332.57	1.805	21706			
09/07/2023	59.58	0.879	20310	09/07/2023	661.62	1.364	31480	09/07/2023	1332.39	1.731	20899			
09/08/2023	59.59	0.852	20093	09/08/2023	661.66	1.327	32203	09/08/2023	1332.42	1.763	20956			
09/09/2023	59.59	0.829	20117	09/09/2023	661.60	1.457	31387	09/09/2023	1332.34	1.830	21503			
09/10/2023	59.58	0.878	20038	09/10/2023	661.57	1.354	31555	09/10/2023	1332.35	1.795	21275			
09/11/2023	59.59	0.844	19986	09/11/2023	661.55	1.359	31972	09/11/2023	1332.27	1.785	21875			
09/11/2023	59.60	0.839	19838	09/11/2023	661.73	1.363	31958	09/11/2023	1332.63	1.925	20922			
09/11/2023	59.60	0.889	19825	09/11/2023	661.75	1.328	31744	09/11/2023	1332.65	1.709	21434			
09/12/2023	59.59	0.854	20330	09/12/2023	661.74	1.344	31730	09/12/2023	1332.63	1.648	20951			
09/13/2023	59.59	0.892	20813	09/13/2023	661.73	1.325	31861	09/13/2023	1332.59	1.816	21753			
09/14/2023	59.58	0.843	20330	09/14/2023	661.71	1.350	31292	09/14/2023	1332.55	1.767	21695			
09/15/2023	59.59	0.860	19828	09/15/2023	661.76	1.323	32020	09/15/2023	1332.64	1.775	21810			
09/18/2023	59.58	0.895	19901	09/18/2023	661.64	1.354	32435	09/18/2023	1332.43	1.715	21932			
09/19/2023	59.54	0.881	21148	09/19/2023	661.61	1.325	32387	09/19/2023	1332.41	1.830	21552			
09/20/2023	59.58	0.877	19930	09/20/2023	661.65	1.398	31451	09/20/2023	1332.48	1.698	21338			
09/21/2023	59.58	0.888	19982	09/21/2023	661.55	1.445	32310	09/21/2023	1332.28	1.831	21492			
09/21/2023	59.60	0.867	19824	09/21/2023	661.74	1.414	31790	09/21/2023	1332.65	1.711	21528			
09/21/2023	59.60	0.876	20224	09/21/2023	661.75	1.395	31405	09/21/2023	1332.66	1.766	21545			
09/22/2023	59.60	0.858	20211	09/22/2023	661.80	1.371	32009	09/22/2023	1332.74	1.731	21559			
09/24/2023	59.54	0.881	20811	09/24/2023	661.73	1.350	31650	09/24/2023	1332.63	1.695	21081			
09/25/2023	59.60	0.848	20710	09/25/2023	661.73	1.405	31828	09/25/2023	1332.58	1.668	21371			
09/26/2023	59.61	0.854	20078	09/26/2023	661.83	1.344	32146	09/26/2023	1332.78	1.621	22115			
09/27/2023	59.58	0.831	19910	09/27/2023	661.79	1.359	31431	09/27/2023	1332.76	1.680	21496			
09/28/2023	59.61	0.849	19600	09/28/2023	661.77	1.329	31714	09/28/2023	1332.66	1.808	21153			
09/29/2023	59.62	0.864	20302	09/29/2023	661.82	1.398	31841	09/29/2023	1332.83	1.731	21503			
09/30/2023	59.59	0.895	20015	09/30/2023	661.76	1.327	31929	09/30/2023	1332.69	1.678	21374			
10/01/2023	59.59	0.855	20352	10/01/2023	661.76	1.312	31738	10/01/2023	1332.64	1.713	21145			
10/02/2023	59.60	0.830	19854	10/02/2023	661.73	1.378	31930	10/02/2023	1332.56	1.722	22465			



Detector: ARS06				Calibration Verification				CalVer: 119600			
Acceptable performance rules: during baseline development - Energy $\leq \pm 0.5$ keV of known, Activity $\leq \pm 5\%$ of known, FWHM $\leq 125\%$ of known; after baseline development - Energy $\leq \pm 0.5$ keV of known, Activity $\leq \pm 3\sigma$, FWHM $\leq 125\%$ of known.											
Am-241				Cs-137				Co-60			
Max FWHM/Known Act	1.136	40000.00		Max FWHM/Known Act	1.964	57270.27		Max FWHM/Known Act	2.566	67189.19	
Average	59.614	0.909	36527	Average	661.714	1.571	57796	Average	1332.589	2.053	67742
Std Deviation	0.014	436.05		Std Deviation	0.032	403.80		Std Deviation	0.126	1168.59	
Analysis Date	Energy keV	FWHM keV	Activity pCi	Analysis Date	Energy keV	FWHM keV	Activity pCi	Analysis Date	Energy keV	FWHM keV	Activity pCi
09/09/2023	59.61	0.923	36075	09/09/2023	661.70	1.560	58683	09/09/2023	1332.62	2.123	66291
09/10/2023	59.60	0.903	36899	09/10/2023	661.72	1.611	57423	09/10/2023	1332.57	2.167	67340
09/11/2023	59.59	0.913	37337	09/11/2023	661.72	1.607	58210	09/11/2023	1332.55	2.004	68131
09/12/2023	59.61	0.914	37072	09/12/2023	661.66	1.585	57265	09/12/2023	1332.44	2.066	68439
09/13/2023	59.61	0.908	36159	09/13/2023	661.66	1.546	57518	09/13/2023	1332.46	2.036	67450
09/14/2023	59.60	0.909	36213	09/14/2023	661.64	1.635	57177	09/14/2023	1332.45	2.198	68298
09/15/2023	59.61	0.894	35939	09/15/2023	661.69	1.528	56945	09/15/2023	1332.50	2.006	65946
09/18/2023	59.61	0.935	36453	09/18/2023	661.62	1.529	58564	09/18/2023	1332.40	1.909	67036
09/19/2023	59.54	0.944	37878	09/19/2023	661.63	1.544	57400	09/19/2023	1332.35	2.061	68541
09/19/2023	59.61	0.904	36428	09/19/2023	661.70	1.492	57138	09/19/2023	1332.51	2.121	67199
09/19/2023	59.61	0.930	36457	09/19/2023	661.70	1.575	57528	09/19/2023	1332.51	2.057	67247
09/20/2023	59.54	0.944	37508	09/20/2023	661.69	1.506	57096	09/20/2023	1332.48	2.043	67813
09/21/2023	59.61	0.903	36644	09/21/2023	661.70	1.547	57458	09/21/2023	1332.52	2.145	67321
09/22/2023	59.61	0.904	36277	09/22/2023	661.68	1.590	58446	09/22/2023	1332.51	2.055	66734
09/24/2023	59.61	0.902	36896	09/24/2023	661.70	1.540	56987	09/24/2023	1332.46	2.085	67051
09/25/2023	59.54	0.944	37056	09/25/2023	661.70	1.509	56199	09/25/2023	1332.54	2.064	65626
09/25/2023	59.62	0.891	36276	09/25/2023	661.68	1.538	57317	09/25/2023	1332.51	1.963	65718
09/25/2023	59.61	0.899	35517	09/25/2023	661.69	1.555	56557	09/25/2023	1332.50	2.024	68136
09/25/2023	59.61	0.912	36997	09/25/2023	661.70	1.541	58104	09/25/2023	1332.57	1.916	65832
09/25/2023	59.62	0.909	36713	09/25/2023	661.69	1.571	57168	09/25/2023	1332.51	1.988	68038
09/26/2023	59.60	0.886	36734	09/26/2023	661.69	1.502	57886	09/26/2023	1332.50	2.078	67083
09/27/2023	59.63	0.906	35920	09/27/2023	661.70	1.563	56906	09/27/2023	1332.52	2.068	68210
09/28/2023	59.62	0.878	36296	09/28/2023	661.68	1.539	56323	09/28/2023	1332.54	2.195	66695
09/28/2023	59.62	0.902	36403	09/28/2023	661.68	1.584	56163	09/28/2023	1332.53	2.263	67567
09/28/2023	59.61	0.919	36420	09/28/2023	661.70	1.533	58155	09/28/2023	1332.50	2.295	66637
09/28/2023	59.60	0.920	36796	09/28/2023	661.69	1.596	57124	09/28/2023	1332.58	1.824	67230
09/29/2023	59.63	0.901	36796	09/29/2023	661.73	1.479	57502	09/29/2023	1332.58	1.926	65065
09/30/2023	59.54	0.944	37814	09/30/2023	661.70	1.565	57851	09/30/2023	1332.51	1.875	65973
10/01/2023	59.62	0.899	36533	10/01/2023	661.69	1.547	57299	10/01/2023	1332.54	2.231	67447
10/02/2023	59.62	0.904	36592	10/02/2023	661.69	1.511	57474	10/02/2023	1332.51	2.367	69165





ARS Aleut Analytical, LLC Analytical Reports

for

GES-AIS, LLC

Gamma Spec - Daily Source Checks Raw Data

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 7:14:59 AM
 AAA Spectrum name: ARS03244.An1

Sample description

Batch ID: Calver
 SDG ID: 1595-98-4 Tech: SDW

Spectrum Filename: C:\User\ARS03244.An1

Acquisition information

Start time: 9/29/2023 7:04:44 AM
 Live time: 600
 Real time: 604
 Dead time: 0.58 %
 Detector ID: 17

Detector system

(ARS03) MCB 129

Calibration

Filename: 1948-64-2 250mL tuna can cal 11-30-17.Cl
 b

250mL tuna can 1948-64-2
 EEC 11-30-17

Energy Calibration

Created: 11/29/2017 9:57:33 AM
 Zero offset: 0.260 keV
 Gain: 0.250 keV/channel
 Quadratic: -1.893E-08 keV/channel^2

Efficiency Calibration

Created: 11/30/2017 9:51:22 AM
 Knee Energy: 150.00 keV
 Above the Knee: Quadratic Uncertainty = 0.74 %
 Log(Eff): $-8.414671E-01 + (-2.995631E-01 * \text{Log}(E)) + (-3.378341E-02 * \text{Log}(E)^2)$
 Below the Knee: Quadratic Uncertainty = 0.80 %
 Log(Eff): $-2.146319E+01 + (7.916197E+00 * \text{Log}(E)) + (-8.522452E-01 * \text{Log}(E)^2)$

Library Files

Main analysis library: LCS Fission.Lib
 Library Match Width: 0.500
 Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G800W064
 Start channel: 115 (28.98keV)
 Stop channel: 8000 (1996.70keV)
 Peak rejection level: 40.000%
 Peak search sensitivity: 2
 Sample Size: 1.0000E+00 +/- 0.000E+00%
 Activity scaling factor: $1.0000E+06 / (1.0000E+00 * 1.0000E+00) = 1.0000E+06$
 Detection limit method: Reg. Guide 4.16 Method

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 7:14:59 AM
 AAA Spectrum name: ARS03244.An1

Random error: 1.0000000E+00
 Systematic error: 1.0000000E+00
 Fraction Limit: 0.000%
 Background width: best method (based on spectrum).
 Half lives decay limit: 12.000
 Activity range factor: 2.000
 Min. step backg. energy 0.000
 Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	6/1/2017 2:00:00 PM
Decay during acquisition:	NO	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	LCS.LCSD.Pbc 9/21/2023 8:27:04 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 0 cutoff: 0.00E+00 %
 Energy Calibration
 Normalized diff: 0.1243

***** S U M M A R Y O F P E A K S I N R A N G E *****

Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
32.04	234.	14.58	0.95	1.415E-02				
36.79	109.	30.37	0.66	1.819E-02				
46.60	3504.	2.42	0.83	2.653E-02				
59.62	5707.	1.59	0.86	3.527E-02	59.54	36.300	2.030E+04	AM241
661.82	7716.	1.16	1.40	1.481E-02	661.66	85.210	3.184E+04	CS137
1173.51	2026.	2.31	1.73	9.597E-03	1173.24	99.900	2.187E+04	CO60
1332.83	1774.	2.37	1.73	8.688E-03	1332.50	99.982	2.113E+04	CO60

***** U N I D E N T I F I E D P E A K S U M M A R Y *****

Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 1 Sigma	FWHM %	Suspected Nuclide
127.27	32.10	370.	234.	1.651E+04	14.58	0.953	XE-138
146.31	36.66	466.	109.	5.971E+03	30.37	0.663	CE-141
185.60	46.61	1424.	3504.	1.321E+05	2.42	0.827	PB-210

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 L - Peak written from unknown list.
 C - Area < Critical level.

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 7:14:59 AM
 AAA Spectrum name: ARS03244.An1

 This section based on library: LCS Fission.Lib

***** I D E N T I F I E D P E A K S U M M A R Y *****

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 1 Sigma	FWHM %	keV
AM-241	237.71	59.62	973.	5707.	9.512	1.59	0.864	
CS-137	2649.89	661.82	94.	7716.	12.861	1.16	1.398	
CO-60	4700.21	1173.51	40.	2026.	3.377	2.31	1.731	
CO-60	5338.69	1332.83	0.	1774.	2.957	2.37	1.731	

s - Peak fails shape tests.

D - Peak area deconvoluted.

A - Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	- Average Code	Activity pCi/g	Energy keV	Peak Activity pCi/g	Code	MDA Value pCi/g	COMMENTS
---------------------	-------------------	-------------------	---------------	---------------------------	------	--------------------	----------

AM-241	2.0302E+04		59.54	2.030E+04	(5.267E+02	1.58E+05 1.59E+00 3.63E+01 G
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CS-137	3.1841E+04		661.66	3.184E+04	(1.972E+02	1.10E+04 1.16E+00 8.52E+01 G
--------	------------	--	--------	-----------	---	-----------	---------------------------------

CO-60	2.1503E+04		1173.24	2.187E+04	(3.458E+02	1.93E+03 2.31E+00 9.99E+01 G
			1332.50	2.113E+04	(	8.780E+01	2.37E+00 1.00E+02 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.

! - Peak is part of a multiplet and this area went negative during deconvolution.

? - Peak is too narrow.

@ - Peak is too wide at FW25M, but ok at FWHM.

% - Peak fails sensitivity test.

\$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.

+ - Peak activity higher than counting uncertainty range.

- - Peak activity lower than counting uncertainty range.

= - Peak outside analysis energy range.

& - Calculated peak centroid is not close enough to the library energy centroid for positive identification.

P - Peakbackground subtraction

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 7:14:59 AM
 AAA Spectrum name: ARS03244.An1

} - Peak is too close to another for the activity
 to be found directly.

Nuclide Codes:

T - Thermal Neutron Activation
 F - Fast Neutron Activation
 I - Fission Product
 N - Naturally Occurring Isotope
 P - Photon Reaction
 C - Charged Particle Reaction
 M - No MDA Calculation
 R - Coincidence Corrected
 H - Halflife limit exceeded

Peak Codes:

G - Gamma Ray
 X - X-Ray
 P - Positron Decay
 S - Single-Escape
 D - Double-Escape
 K - Key Line
 A - Not in Average
 C - Coincidence Peak

***** D I S C A R D E D I S O T O P E P E A K S *****

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 1 Sigma	Activity %
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P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Time Corrected Activity pCi/g	Uncertainty Counting pCi/g	1 Sigma Total pCi/g	MDA pCi/g
AM-241	2.0097E+04	2.0302E+04	3.2284E+02	7.7178E+02	5.267E+02
CS-137	2.7534E+04	3.1841E+04	3.6987E+02	7.3799E+02	1.972E+02
CO-60	9.3580E+03	2.1503E+04	3.5637E+02	5.1962E+02	3.458E+02

< - MDA value printed.

A - Activity printed, but activity < MDA.

B - Activity < MDA and failed test.

C - Area < Critical level.

F - Failed fraction or key line test.

H - Halflife limit exceeded

----- S U M M A R Y -----
 Total Activity (29.0 to 1996.7 keV) 5.699E+04 pCi/g
 Total Decayed Activity (29.0 to 1996.7 keV) 7.3645086E+04 pCi/g

Analyzed by: _____
 Countroom

Reviewed by: _____
 Supervisor

Laboratory: AAA

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 7:13:09 AM
 AAA Spectrum name: ARS06045.An1

Sample description

Batch ID: Calver
 SDG ID: 119600 Tech: SDW

Spectrum Filename: C:\User\ARS06045.An1

Acquisition information

Start time: 9/29/2023 7:02:58 AM
 Live time: 600
 Real time: 604
 Dead time: 0.70 %
 Detector ID: 21

Detector system

ARS06 MCB 133

Calibration

Filename: 2199-26-1 250mL jar cal 7-6-21.Clb
 2199-26-1 250mL jar
 EEC 7-6-21

Energy Calibration

Created: 7/6/2021 3:23:54 PM
 Zero offset: 0.147 keV
 Gain: 0.250 keV/channel
 Quadratic: -3.188E-08 keV/channel^2

Efficiency Calibration

Created: 7/7/2021 6:24:21 AM
 Knee Energy: 130.00 keV
 Above the Knee: Quadratic Uncertainty = 1.54 %
 Log(Eff): $-1.869416E+00 + (-3.968678E-02 * \text{Log}(E)) + (-5.049798E-02 * \text{Log}(E)^2)$
 Below the Knee: Quadratic Uncertainty = 2.03 %
 Log(Eff): $-1.168008E+01 + (3.811151E+00 * \text{Log}(E)) + (-4.269526E-01 * \text{Log}(E)^2)$

Library Files

Main analysis library: LCS Fission.Lib
 Library Match Width: 0.500
 Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G800W064
 Start channel: 115 (28.90keV)
 Stop channel: 8000 (1998.06keV)
 Peak rejection level: 40.000%
 Peak search sensitivity: 1
 Sample Size: 1.0000E+00 +/- 0.000E+00%
 Activity scaling factor: $1.0000E+06 / (1.0000E+00 * 1.0000E+00) = 1.0000E+06$
 Detection limit method: Reg. Guide 4.16 Method

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 7:13:09 AM
 AAA Spectrum name: ARS06045.An1

Random error: 1.0000000E+00
 Systematic error: 1.0000000E+00
 Fraction Limit: 0.000%
 Background width: best method (based on spectrum).
 Half lives decay limit: 12.000
 Activity range factor: 2.000
 Min. step backg. energy 0.000
 Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	YES	10/1/2007 2:00:00 PM
Decay during acquisition:	NO	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	LCS.LCSD.Pbc 9/21/2023 8:04:19 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 0 cutoff: 0.00E+00 %
 Energy Calibration
 Normalized diff: 0.0579

***** S U M M A R Y O F P E A K S I N R A N G E *****								
Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
32.23	1040.	5.06	0.97	2.749E-02				
36.65	339.	13.90	1.07	3.046E-02				
46.70	1871.	3.60	0.93	3.545E-02				
49.65	243.	24.68	0.93	3.657E-02				
59.63	11368.	1.15	0.90	3.935E-02	59.54	36.300	3.680E+04	AM241
661.73	10667.	1.00	1.48	1.416E-02	661.66	85.210	5.750E+04	CS137
945.29	38.	37.77	0.44	1.098E-02				
954.49	62.	35.19	0.45	1.090E-02				
1048.46	26.	39.55	0.57	1.017E-02				
1173.36	1626.	2.61	1.79	9.350E-03	1173.24	99.900	6.423E+04	CO60
1186.91	21.	28.59	0.29	9.270E-03				
1332.58	1516.	2.61	1.93	8.488E-03	1332.50	99.982	6.590E+04	CO60

***** U N I D E N T I F I E D P E A K S U M M A R Y *****								
Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Efficiency * Area	Uncert 2 Sigma	FWHM %	Suspected keV	Nuclide
128.34	32.23	692.	1040.	3.781E+04	10.12	0.967	-	
146.01	36.69	753.	339.	1.113E+04	27.81	1.068	-	s
186.22	46.65	1337.	1871.	5.277E+04	7.21	0.929	-	D

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 7:13:09 AM
 AAA Spectrum name: ARS06045.An1

Channel	Energy	Background	Net area	Eff*Area	Uncert	FWHM	Suspected
198.02	49.60	1673.	243.	6.638E+03	49.36	0.932	- sD
3782.47	945.29	56.	38.	3.461E+03	75.54	0.444	- s
3819.32	954.40	90.	62.	5.687E+03	70.38	0.454	- s
4195.59	1048.77	31.	26.	2.596E+03	79.10	0.574	- s
4750.04	1186.86	4.	21.	2.222E+03	57.17	0.290	- s

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 L - Peak written from unknown list.
 C - Area < Critical level.

 This section based on library: LCS Fission.Lib

***** I D E N T I F I E D P E A K S U M M A R Y *****

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma	FWHM % keV
AM-241	237.93	59.63	1938.	11368.	18.947	2.29	0.901
CS-137	2647.29	661.73	157.	10667.	17.779	2.00	1.479
CO-60	4695.79	1173.36	35.	1626.	2.710	5.22	1.790
CO-60	5333.48	1332.58	6.	1516.	2.526	5.22	1.926

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 A - Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide -	Average	Energy	Activity	Code	MDA Value	COMMENTS
Name	Code	Activity	Energy	Activity	Code	MDA Value
		pCi/g	keV	pCi/g		pCi/g

AM-241	3.6796E+04	59.54	3.680E+04	(	6.728E+02	1.15E+00	3.63E+01 G
CS-137	5.7502E+04	661.66	5.750E+04	(	3.292E+02	9.98E-01	8.52E+01 G
CO-60	6.5065E+04	1173.24	6.423E+04	(	1.198E+03	2.61E+00	9.99E+01 G
		1332.50	6.590E+04	(	6.344E+02	2.61E+00	1.00E+02 G

(- This peak used in the nuclide activity average.

* - Peak is too wide, but only one peak in library.
 ! - Peak is part of a multiplet and this area went negative during deconvolution.
 ? - Peak is too narrow.

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 7:13:09 AM
 AAA Spectrum name: ARS06045.An1

@ - Peak is too wide at FW25M, but ok at FWHM.
 % - Peak fails sensitivity test.
 \$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
 + - Peak activity higher than counting uncertainty range.
 - - Peak activity lower than counting uncertainty range.
 = - Peak outside analysis energy range.
 & - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
 P - Peakbackground subtraction
 } - Peak is too close to another for the activity to be found directly.

Nuclide Codes:

T - Thermal Neutron Activation
 F - Fast Neutron Activation
 I - Fission Product
 N - Naturally Occurring Isotope
 P - Photon Reaction
 C - Charged Particle Reaction
 M - No MDA Calculation
 R - Coincidence Corrected
 H - Halflife limit exceeded

Peak Codes:

G - Gamma Ray
 X - X-Ray
 P - Positron Decay
 S - Single-Escape
 D - Double-Escape
 K - Key Line
 A - Not in Average
 C - Coincidence Peak

***** D I S C A R D E D I S O T O P E P E A K S *****

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma	Activity %
---------	-----------------	-------------------	-----------------	-------------------	----------------	------------

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count	Time Corrected	Uncertainty	2 Sigma	MDA
	Activity pCi/g	Activity pCi/g	Counting pCi/g	Total pCi/g	pCi/g
AM-241	3.5863E+04	3.6796E+04	8.4376E+02	2.7288E+03	6.728E+02
CS-137	3.9821E+04	5.7502E+04	1.1473E+03	2.5688E+03	3.292E+02
CO-60	7.9417E+03	6.5065E+04	2.4005E+03	3.3159E+03	1.198E+03

< - MDA value printed.
 A - Activity printed, but activity < MDA.
 B - Activity < MDA and failed test.
 C - Area < Critical level.
 F - Failed fraction or key line test.
 H - Halflife limit exceeded

----- S U M M A R Y -----
 Total Activity (28.9 to 1998.1 keV) 8.363E+04 pCi/g
 Total Decayed Activity (28.9 to 1998.1 keV) 1.5936234E+05 pCi/g

Analyzed by: _____
 Countroom

ORTEC g v - i (3263) Env32 G800W064 9/29/2023 7:13:09 AM
AAA Spectrum name: ARS06045.An1

Reviewed by: _____
Supervisor

Laboratory: AAA



ARS Aleut Analytical, LLC Analytical Reports

for

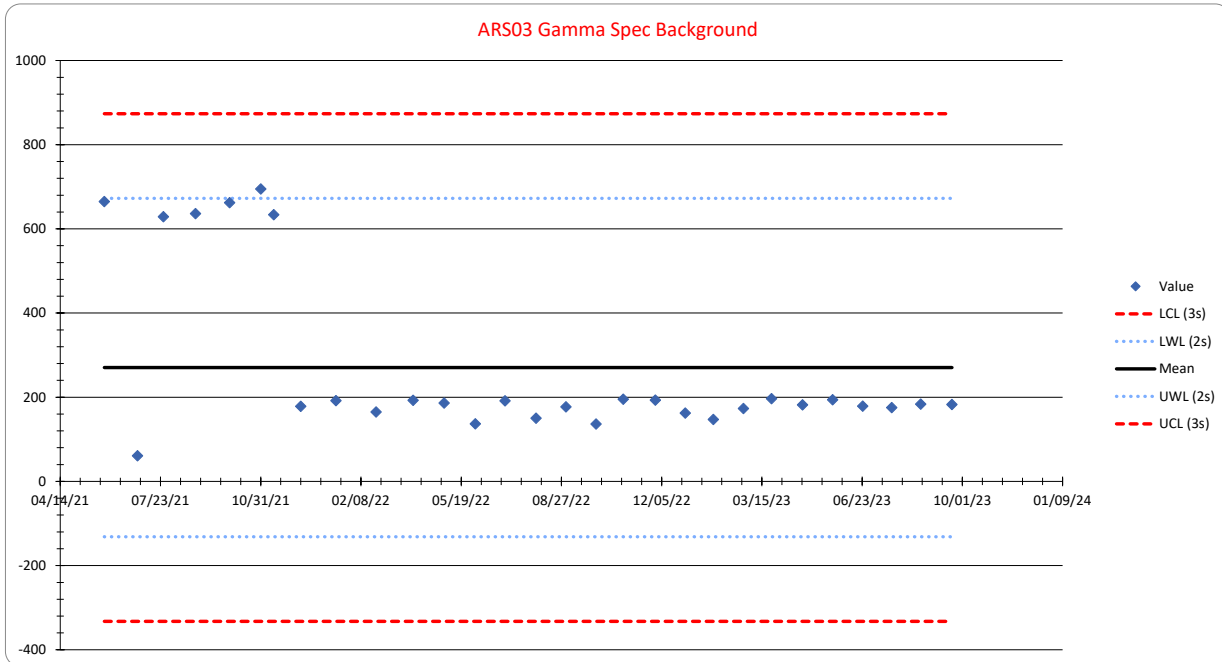
GES-AIS, LLC

Gamma Spec - Monthly Backgrounds

AnalysisDate	Activity	Units	LCL	LWL	Mean	UWL	UCL	CountTime
05/28/2021	664.8	pCi/g	-332.5258	-131.518	270.4976	672.5132	873.521	
06/30/2021	60.63	pCi/g	-332.5258	-131.518	270.4976	672.5132	873.521	
07/26/2021	628.8	pCi/g	-332.5258	-131.518	270.4976	672.5132	873.521	
08/27/2021	635.8	pCi/g	-332.5258	-131.518	270.4976	672.5132	873.521	
09/30/2021	662.1	pCi/g	-332.5258	-131.518	270.4976	672.5132	873.521	
10/31/2021	694.5	pCi/g	-332.5258	-131.518	270.4976	672.5132	873.521	
11/13/2021	633.3	pCi/g	-332.5258	-131.518	270.4976	672.5132	873.521	
12/10/2021	178.1	pCi/g	-332.5258	-131.518	270.4976	672.5132	873.521	
01/14/2022	191.5	pCi/g	-332.5258	-131.518	270.4976	672.5132	873.521	
02/23/2022	164.7	pCi/g	-332.5258	-131.518	270.4976	672.5132	873.521	
04/01/2022	192.4	pCi/g	-332.5258	-131.518	270.4976	672.5132	873.521	
05/02/2022	185.9	pCi/g	-332.5258	-131.518	270.4976	672.5132	873.521	
06/02/2022	136.6	pCi/g	-332.5258	-131.518	270.4976	672.5132	873.521	
07/01/2022	191.3	pCi/L	-332.5258	-131.518	270.4976	672.5132	873.521	
08/01/2022	150.2	pCi/L	-332.5258	-131.518	270.4976	672.5132	873.521	
08/31/2022	177	pCi/L	-332.5258	-131.518	270.4976	672.5132	873.521	
09/30/2022	136.2	pCi/L	-332.5258	-131.518	270.4976	672.5132	873.521	
10/27/2022	194.9	pCi/L	-332.5258	-131.518	270.4976	672.5132	873.521	
11/28/2022	193	pCi/L	-332.5258	-131.518	270.4976	672.5132	873.521	
12/28/2022	162	pCi/L	-332.5258	-131.518	270.4976	672.5132	873.521	
01/25/2023	146.8	pCi/L	-332.5258	-131.518	270.4976	672.5132	873.521	
02/24/2023	172.9	pCi/L	-332.5258	-131.518	270.4976	672.5132	873.521	
03/24/2023	196.2	pCi/L	-332.5258	-131.518	270.4976	672.5132	873.521	
04/24/2023	181.5	pCi/L	-332.5258	-131.518	270.4976	672.5132	873.521	
05/24/2023	193.8	pCi/L	-332.5258	-131.518	270.4976	672.5132	873.521	
06/23/2023	178.5	pCi/L	-332.5258	-131.518	270.4976	672.5132	873.521	
07/22/2023	175	pCi/L	-332.5258	-131.518	270.4976	672.5132	873.521	
08/20/2023	183.3	pCi/L	-332.5258	-131.518	270.4976	672.5132	873.521	60000
09/20/2023	182.7	pCi/L	-332.5258	-131.518	270.4976	672.5132	873.521	60000

Population Statistic

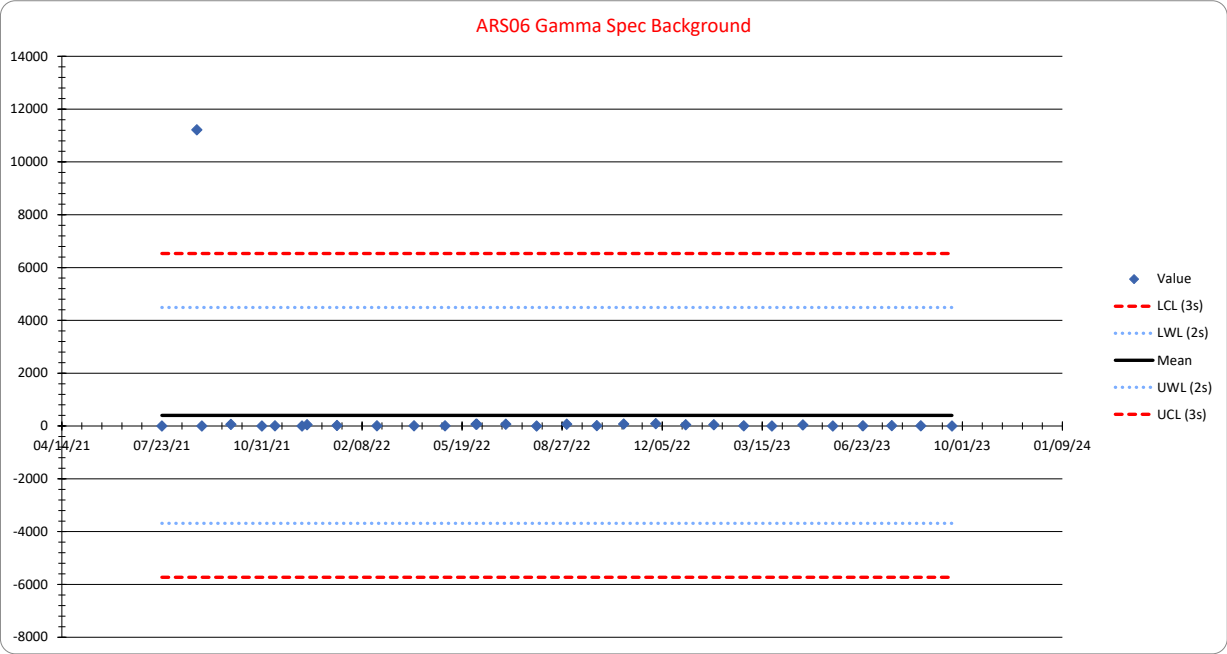
Population	29
Average	270.4976
Std. Deviation	201.0078
+ 3-sigma value	873.5210
- 3-sigma value	-332.5258



AnalysisDate	Activity	Units	LCL	LWL	Mean	UWL	UCL	CountTime
07/23/2021	4.3	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
08/27/2021	11220	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
09/01/2021	0	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
09/30/2021	64.8	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
10/31/2021	0	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
11/13/2021	10.9	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
12/10/2021	0	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
12/15/2021	52.2	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
01/14/2022	19.7	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
02/23/2022	8.3	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
04/01/2022	6	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
05/02/2022	8.9	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
06/02/2022	68.9	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
06/02/2022	68.91	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
07/01/2022	72.4	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
08/01/2022	0	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
08/31/2022	71.53	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
09/30/2022	18.04	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
10/27/2022	77.26	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
11/28/2022	92.59	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
12/28/2022	47.18	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
01/25/2023	47.91	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
02/24/2023	11.57	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
03/24/2023	0	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
04/24/2023	44.63	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
05/24/2023	0	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
06/23/2023	7.48	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
07/22/2023	12.45	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	
08/20/2023	11.02	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	60000
09/20/2023	0	pCi/g	-5728.914	-3685.421	401.5657	4488.552	6532.046	60000

Population Statistic

Population	30
Average	401.5657
Std. Deviation	2043.4933
+ 3-sigma value	6532.0457
- 3-sigma value	-5728.9143





ARS Aleut Analytical, LLC Analytical Reports

for

GES-AIS, LLC

Gamma Spec - Monthly Backgrounds Raw Data

ORTEC g v - i (3263) Env32 G800W064 9/21/2023 8:20:00 AM
 AAA Spectrum name: ARS03173.An1

Sample description

Batch ID: Long Bkg
 SDG ID: Tech: CDW

Spectrum Filename: C:\User\ARS03173.An1

Acquisition information

Start time: 9/20/2023 2:32:30 PM
 Live time: 60000
 Real time: 60052
 Dead time: 0.09 %
 Detector ID: 17

Detector system

(ARS03) MCB 129

Calibration

Filename: 117495 47mm AF cal 1-6-21.Clb
 47mm AF 117495
 1-6-21 EEC

Energy Calibration

Created: 1/6/2021 9:40:20 AM
 Zero offset: 0.213 keV
 Gain: 0.250 keV/channel
 Quadratic: -2.204E-08 keV/channel^2

Efficiency Calibration

Created: 1/6/2021 9:47:25 AM
 Knee Energy: 130.00 keV
 Above the Knee: Quadratic Uncertainty = 0.96 %
 Log(Eff): $-3.057202E-01 + (1.575027E-01 * \text{Log}(E)) + (-8.666885E-02 * \text{Log}(E)^2)$
 Below the Knee: Quadratic Uncertainty = 1.63 %
 Log(Eff): $-4.598458E+00 + (1.629076E+00 * \text{Log}(E)) + (-2.077827E-01 * \text{Log}(E)^2)$

Library Files

Main analysis library: NORM.Lib
 Library Match Width: 0.500
 Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G800W064
 Start channel: 120 (30.19keV)
 Stop channel: 8000 (1997.15keV)
 Peak rejection level: 40.000%
 Peak search sensitivity: 1
 Sample Size: 1.0000E+00 +/- 0.000E+00%
 Activity scaling factor: $1.0000E+06 / (1.0000E+00 * 1.0000E+00) = 1.0000E+06$
 Detection limit method: Reg. Guide 4.16 Method

ORTEC g v - i (3263) Env32 G800W064 9/21/2023 8:20:00 AM
 AAA Spectrum name: ARS03173.An1

Random error: 1.0000000E+00
 Systematic error: 1.0000000E+00
 Fraction Limit: 0.000%
 Background width: best method (based on spectrum).
 Half lives decay limit: 12.000
 Activity range factor: 2.000
 Min. step backg. energy 0.000
 Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	NO	
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	norm.Pbc 8/21/2023 8:55:30 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 0 cutoff: 0.00E+00 %
 Energy Calibration
 Normalized diff: 0.1713

***** S U M M A R Y O F P E A K S I N R A N G E *****								
Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
46.65	836.	6.55	0.96	2.450E-01	46.52	4.000	PBC<MDA	PB210
63.18	739.	7.68	0.92	2.427E-01	63.29	3.900	PBC<MDA	U238
72.89	119.	35.88	0.89	2.385E-01				
74.85	337.	13.42	0.89	2.375E-01				
77.27	267.	15.74	0.89	2.362E-01				
84.44	226.	20.96	1.47	2.320E-01				
92.58	951.	6.39	1.15	2.271E-01	92.38	2.570	4.595E+01	U238
					92.80	3.000	2.984E+01	U238
185.76	529.	9.92	1.02	1.575E-01	186.10	3.500	PBC<MDA	RA226
198.30	113.	33.28	0.55	1.500E-01				
238.50	407.	10.70	1.05	1.299E-01	238.63	43.100	PBC<MDA	PB212
241.89	106.	32.74	1.04	1.284E-01	241.98	7.500	PBC<MDA	PB214
295.05	204.	20.41	1.01	1.094E-01	295.21	18.500	PBC<MDA	PB214
					296.00	80.000	1.054E+00	TL210
351.94	360.	13.09	1.07	9.423E-02	351.92	35.800	PBC<MDA	PB214
433.98	98.	32.29	1.72	7.838E-02				
511.05	2009.	3.57	2.63	6.758E-02	510.72	22.500	5.947E+01	TL208
583.31	146.	21.96	1.85	5.972E-02	583.14	86.000	PBC<MDA	TL208
609.17	246.	11.78	1.35	5.732E-02	609.31	44.791	PBC<MDA	BI214
614.73	79.	32.06	1.35	5.682E-02				
802.80	79.	29.48	1.50	4.376E-02				
825.21	70.	27.68	2.09	4.256E-02				

ORTEC g v - i (3263) Env32 G800W064 9/21/2023 8:20:00 AM
 AAA Spectrum name: ARS03173.An1

pk energy	area	uncert	fwhm	corr	nuclide	brnch.	act.	nuc
911.47	124.	18.80	1.75	3.850E-02	911.07	29.000	PBC<MDA	Ra228
916.76	40.	38.88	1.58	3.825E-02				
934.22	42.	39.81	2.31	3.752E-02	934.06	3.029	PBC<MDA	BI214
969.09	78.	26.48	1.66	3.613E-02	968.90	17.460	PBC<MDA	Ra228
1014.63	63.	35.51	1.59	3.444E-02				
1120.59	79.	21.90	1.23	3.103E-02	1120.29	14.797	PBC<MDA	BI214
1249.61	31.	37.01	0.93	2.762E-02				
1461.14	208.	11.00	1.88	2.328E-02	1460.75	10.700	PBC<MDA	K40
1764.46	107.	21.65	2.36	1.884E-02	1764.49	15.357	PBC<MDA	BI214
1873.53	27.	38.16	0.52	1.759E-02				

***** U N I D E N T I F I E D P E A K S U M M A R Y *****

Peak Centroid Channel	Background Energy	Net Area Counts	Efficiency * Area	Uncert 2 Sigma	FWHM %	Suspected Nuclide
185.90	46.61	862.	836. 3.566E+03	13.09	0.963	PB-210 l
252.07	63.25	957.	739. 3.148E+03	15.37	0.916	TH-234 l
290.94	72.85	846.	119. 4.974E+02	71.77	0.889	TL-208 D
298.81	74.81	856.	337. 1.420E+03	26.84	0.891	TH-234 D
308.51	77.23	752.	267. 1.132E+03	31.48	0.893	PB-212 sD
337.20	84.53	879.	226. 9.749E+02	41.92	1.467	HG-203 s
369.79	92.59	1013.	951. 4.218E+03	12.77	1.147	TH-234 l
742.85	185.74	856.	529. 3.581E+03	19.84	1.022	U-235 l
793.04	198.23	589.	113. 7.522E+02	66.56	0.551	SE-75 sM
1180.45	294.97	568.	204. 2.103E+03	40.82	1.008	RU-103 l
1408.25	351.97	598.	360. 3.982E+03	26.18	1.069	PB-214 l
1736.79	434.22	333.	98. 1.248E+03	64.59	1.722	RH-106 sM
2045.41	511.10	589.	2009. 2.973E+04	7.13	2.633	NA-22 M
2334.79	583.36	294.	146. 2.638E+03	43.92	1.848	TL-208 l
2460.09	614.73	272.	85. 1.490E+03	59.28	1.350	SB-122 sD
3213.92	802.71	149.	79. 1.803E+03	58.97	1.496	CS-134 M
3303.70	825.29	110.	70. 1.649E+03	55.36	2.090	CO-60 sM
3650.80	911.94	224.	60. 1.558E+03	75.24	1.579	AC-228 sD
3670.39	916.83	101.	40. 1.046E+03	77.75	1.583	XE-138 sD
3740.33	934.23	98.	42. 1.133E+03	79.62	2.307	BI-214 sM
3880.02	969.09	122.	78. 2.427E+03	52.96	1.656	AC-228 l
4062.47	1014.70	125.	63. 1.829E+03	71.02	1.587	- s
4487.00	1120.41	76.	79. 3.158E+03	43.81	1.227	BI-214 l
5003.93	1249.35	44.	31. 1.108E+03	74.03	0.926	RB-89 sM
5851.57	1461.16	78.	208. 9.400E+03	22.00	1.885	K-40 l
7504.43	1873.53	19.	27. 1.535E+03	76.32	0.516	- s

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 L - Peak written from unknown list.
 C - Area < Critical level.
 M - Peak is close to a library peak.

ORTEC g v - i (3263) Env32 G800W064 9/21/2023 8:20:00 AM
 AAA Spectrum name: ARS03173.An1

 This section based on library: NORM.Lib

***** I D E N T I F I E D P E A K S U M M A R Y *****

Nuclide	Peak Channel	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma	FWHM % keV
PB-214	967.95	241.98	546.	106.	0.002	65.48	1.039D
BI-214	2438.93	609.31	1185.	-240.	-0.004	45.56	1.346
Ra-228	3647.61	911.07	664.	-149.	-0.002	53.50	1.579s
BI-214	7067.36	1764.49	262.	-96.	-0.002	75.50	2.142

s - Peak fails shape tests.

D - Peak area deconvoluted.

A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Average Code Activity pCi/g	----- Peak ----- Energy Activity keV pCi/g	Code MDA Value pCi/g	COMMENTS
RA-226	-2.3187E+00	186.10-2.319E+00	5.84E+05 (P 1.608E+01 3.38E+02 3.50E+00	G
Ra-228	-6.0259E+00	911.07-6.026E+00	2.10E+03 (P 4.956E+00 2.67E+01 2.90E+01	G
		968.90-4.095E+00	% P 6.323E+00 9.32E+01 1.75E+01	G
		338.40-3.220E+00	% P 5.251E+00 7.70E+01 1.20E+01	G
		964.60 8.210E+00	% 2.127E+01 7.81E+01 5.45E+00	G
PB-210	-3.2334E+00	46.52-3.233E+00	7.45E+03 (P 9.842E+00 1.32E+02 4.00E+00	G
U-238	-4.3235E+00	63.29-4.324E+00	1.63E+12 (P 1.018E+01 1.12E+02 3.90E+00	G
		92.80-6.882E-01	} P 1.446E+01 9.07E+02 3.00E+00	G
		92.38 6.384E+00	} P 1.836E+01 6.87E+01 2.57E+00	G
U-235	-2.2994E+00	143.76-2.299E+00	1.39E+09 (P 3.907E+00 1.21E+02 1.05E+01	G
		205.31-4.161E+00	% 1.112E+01 1.06E+02 4.70E+00	G
		163.35-3.977E+00	% P 9.052E+00 2.07E+02 4.70E+00	G
K-40	-1.4823E+01	1460.75-1.482E+01	4.68E+11 (P 1.698E+01 5.26E+01 1.07E+01	G

ORTEC g v - i (3263) Env32 G800W064 9/21/2023 8:20:00 AM
 AAA Spectrum name: ARS03173.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
PB-214	1.2373E+00					5.84E+05	
		351.92	4.606E-01	%(P	1.950E+00	1.91E+02	3.58E+01 G
		295.21	-1.236E+00	% P	3.309E+00	1.24E+02	1.85E+01 G
		241.98	4.945E+00	(	5.220E+00	3.27E+01	7.50E+00 G
BI-214	-4.2170E+00					5.84E+05	
		609.31	-4.217E+00	(P	2.863E+00	2.28E+01	4.48E+01 G
		1764.49	-1.495E+01	- P	1.217E+01	3.77E+01	1.54E+01 G
		1120.29	-8.239E+00	% P	8.235E+00	5.20E+01	1.48E+01 G
		1238.11	-3.524E+01	% P	2.427E+01	4.14E+01	5.86E+00 G
		768.36	-1.204E+00	& P	1.925E+01	9.74E+02	4.80E+00 G
		1377.67	-5.029E+00	%	2.792E+01	2.60E+02	3.92E+00 G
		934.06	-2.551E+01	% P	3.377E+01	8.78E+01	3.03E+00 G
BI-212	-6.3160E+00					2.10E+03	
		727.17	-6.316E+00	%(P	8.037E+00	1.04E+02	1.18E+01 G
		1620.56	2.237E+00	% P	3.747E+01	1.09E+03	2.75E+00 G
		785.42	-1.849E-01	% P	3.958E+01	1.27E+04	2.00E+00 G
PB-212	9.5446E-01					2.10E+03	
		238.63	9.545E-01	%(P	1.628E+00	6.72E+01	4.31E+01 G
		300.09	-1.391E+01	% P	1.924E+01	9.40E+01	3.27E+00 G
RA-223	-4.4038E-01					1.20E+07	
		269.39	-4.404E-01	&(	4.042E+00	3.62E+02	1.36E+01 G
		154.18	6.250E-01	%	7.084E+00	4.26E+02	5.59E+00 G
		323.88	-4.035E+00	& P	1.503E+01	3.51E+02	3.90E+00 G
RA-224	-5.2835E+00					2.10E+03	
		241.00	-5.283E+00	%(P	1.898E+01	2.00E+02	3.90E+00 G
TL-208	-6.0785E-01					2.10E+03	
		583.14	-6.079E-01	%(P	1.028E+00	8.61E+01	8.60E+01 G
		510.72	-2.527E+00	%	7.360E+00	8.81E+01	2.25E+01 G
		860.47	-1.298E+00	%	7.859E+00	2.68E+02	1.20E+01 G
		277.36	2.148E+00	%	8.367E+00	1.54E+02	6.50E+00 G
		763.30	-1.267E+01	%	5.176E+01	1.82E+02	1.70E+00 G
TL-210	1.4272E-01					5.84E+05	
		795.00	1.427E-01	%(	8.225E-01	2.55E+02	1.00E+02 G
		296.00	-9.121E-02	%	7.467E-01	3.23E+02	8.00E+01 G
		1310.00	-5.175E+00	& P	6.268E+00	1.19E+02	2.10E+01 G
		1210.00	-7.723E-01	%	6.559E+00	4.00E+02	1.70E+01 G
		1110.00	-1.615E+01	& P	1.627E+01	8.33E+01	7.00E+00 G
		860.00	6.269E+00	&	1.219E+01	8.69E+01	7.00E+00 G
		1410.00	7.317E+00	%	2.073E+01	1.33E+02	5.00E+00 G

ORTEC g v - i (3263) Env32 G800W064 9/21/2023 8:20:00 AM
 AAA Spectrum name: ARS03173.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
BE-7	-2.7498E+00						5.34E+01
		477.56	-2.750E+00	%	(	6.686E+00	1.01E+02 1.03E+01 G
NA-22	-4.1570E-01						9.50E+02
		1274.54	-4.157E-01	%	(P	1.113E+00	2.60E+02 9.99E+01 G
PA-234	1.5509E-01						1.65E+12
		98.44	1.551E-01	%	(P	1.370E+00	4.52E+02 2.51E+01 G
		946.00	-3.446E+00	%	P	5.125E+00	1.29E+02 2.00E+01 G
		131.28	-6.796E-01	%		1.832E+00	1.02E+02 2.00E+01 G
		94.67	-1.520E+00	%	P	3.771E+00	1.17E+02 1.55E+01 G
		883.24	-3.730E+00	%		7.881E+00	9.44E+01 1.20E+01 G
		926.70	-1.552E+00	%		8.664E+00	2.47E+02 1.10E+01 G
		569.26	-1.859E+00	%	P	7.399E+00	2.25E+02 1.04E+01 G
		111.00	8.801E-01	%		4.094E+00	1.76E+02 8.55E+00 G
		733.00	-7.139E+00	&	P	9.953E+00	1.49E+02 8.50E+00 G
		949.00	3.536E+00	%	P	1.169E+01	1.98E+02 7.80E+00 G
		880.51	-1.623E+00	%		1.352E+01	3.67E+02 6.50E+00 G
		226.87	2.895E+00	&		7.374E+00	1.01E+02 6.50E+00 G
		831.10	-2.005E+00	%		1.992E+01	2.95E+02 5.60E+00 G
		808.10	-9.707E+00	%	P	2.326E+01	1.49E+02 4.90E+00 G
		99.70	-8.025E-01	&		7.072E+00	3.32E+02 4.70E+00 G
		699.10	-9.771E+00	%		1.974E+01	8.73E+01 4.60E+00 G
		898.60	2.404E+00	%		2.111E+01	3.86E+02 4.00E+00 G
		1394.10	-8.794E+00	&	P	2.858E+01	1.95E+02 3.90E+00 G
IR-192	5.0178E-03						7.40E+01
		316.49	5.018E-03	%	(	6.561E-01	5.14E+03 8.70E+01 G K
		468.06	3.684E-01	%		1.183E+00	1.32E+02 5.18E+01 G K
		308.44	-7.230E-01	&		1.788E+00	9.82E+01 3.18E+01 G K
		604.40	-4.578E+00	%		1.731E+01	1.14E+02 8.90E+00 G K
		612.45	3.151E-01	%	P	2.035E+01	2.86E+03 5.80E+00 G K
		588.60	-1.013E+01	&	P	1.952E+01	1.34E+02 4.60E+00 G K
		205.78	-1.501E+00	%		1.415E+01	3.73E+02 3.49E+00 G
		484.54	-8.450E+00	%		2.148E+01	1.05E+02 3.35E+00 G
SC-46	2.4531E-01						8.38E+01
		889.26	2.453E-01	%	(	8.457E-01	1.53E+02 1.00E+02 G
TL-201	2.5952E-02						3.06E+00
		70.82	2.595E-02	%	(	1.202E+00	1.39E+03 4.90E+01 G
		68.89	4.283E-01	&		2.134E+00	1.50E+02 2.89E+01 G
		80.20	-7.716E-01	%		4.349E+00	1.70E+02 1.69E+01 G
		167.43	6.175E-01	%		3.806E+00	2.44E+02 1.19E+01 G

(- This peak used in the nuclide activity average.

ORTEC g v - i (3263) Env32 G800W064 9/21/2023 8:20:00 AM
 AAA Spectrum name: ARS03173.An1

- * - Peak is too wide, but only one peak in library.
- ! - Peak is part of a multiplet and this area went negative during deconvolution.
- ? - Peak is too narrow.
- @ - Peak is too wide at FW25M, but ok at FWHM.
- % - Peak fails sensitivity test.
- \$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
- + - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
- = - Peak outside analysis energy range.
- & - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
- P - Peakbackground subtraction
- } - Peak is too close to another for the activity to be found directly.

Nuclide Codes:

T - Thermal Neutron Activation
 F - Fast Neutron Activation
 I - Fission Product
 N - Naturally Occurring Isotope
 P - Photon Reaction
 C - Charged Particle Reaction
 M - No MDA Calculation
 R - Coincidence Corrected
 H - Half-life limit exceeded

Peak Codes:

G - Gamma Ray
 X - X-Ray
 P - Positron Decay
 S - Single-Escape
 D - Double-Escape
 K - Key Line
 A - Not in Average
 C - Coincidence Peak

***** D I S C A R D E D I S O T O P E P E A K S *****

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma	Activity %
---------	-----------------	-------------------	-----------------	-------------------	----------------	------------

BI-214	609.31	1185.	-240.	-0.004	45.56	-4.217E+00 P
Ra-228	911.07	664.	-149.	-0.002	53.50	-6.026E+00 P
BI-214	1764.49	262.	-96.	-0.002	75.50	-1.495E+01 P

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Activity pCi/g	Counting pCi/g	Uncertainty 2 Sigma Total pCi/g	MDA pCi/g
---------	----------------	----------------	---------------------------------	-----------

RA-226 #A	-2.3187E+00	1.5695E+01	1.5698E+01	0.161E+02
Ra-228 #A	-6.0259E+00	3.2237E+00	3.2561E+00	0.496E+01
PB-210 #A	-3.2334E+00	8.5563E+00	8.5623E+00	0.984E+01
U-238 #A	-4.3235E+00	9.7021E+00	9.7082E+00	0.102E+02
U-235 #A	-2.2994E+00	5.5720E+00	5.5941E+00	0.391E+01
K-40 #A	-1.4823E+01	1.5586E+01	1.5620E+01	0.170E+02
PB-214 #A	1.2373E+00	8.1011E-01	8.1765E-01	0.195E+01
BI-214 #A	-4.2170E+00	1.9211E+00	1.9480E+00	0.286E+01

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BI-212	#A	-6.3160E+00	1.3178E+01	1.3188E+01	0.804E+01
PB-212	A	9.5446E-01	1.2824E+00	1.2862E+00	0.163E+01
RA-223	#A	-4.4038E-01	3.1921E+00	3.1924E+00	0.404E+01
RA-224	#A	-5.2835E+00	2.1148E+01	2.1155E+01	0.190E+02
TL-208	#A	-6.0785E-01	1.0467E+00	1.0478E+00	0.103E+01
TL-210	#A	1.4272E-01	7.2772E-01	7.2781E-01	0.823E+00
BE-7	#A	-2.7498E+00	5.5401E+00	5.5439E+00	0.669E+01
NA-22	#A	-4.1570E-01	2.1650E+00	2.1652E+00	0.111E+01
PA-234	#A	1.5509E-01	1.4007E+00	1.4008E+00	0.137E+01
IR-192	#B	5.0178E-03	5.1598E-01	5.1598E-01	0.656E+00
SC-46	A	2.4531E-01	7.4933E-01	7.4956E-01	0.846E+00
TL-201	#A	2.5952E-02	7.2288E-01	7.2289E-01	0.120E+01

- All peaks for activity calculation had bad shape.
 * - Activity omitted from total
 & - Activity omitted from total and all peaks had bad shape.
 < - MDA value printed.
 A - Activity printed, but activity < MDA.
 B - Activity < MDA and failed test.
 C - Area < Critical level.
 F - Failed fraction or key line test.
 H - Half-life limit exceeded

----- S U M M A R Y -----
 Total Activity (30.2 to 1997.2 keV) 0.000E+00 pCi/g

Analyzed by: _____
 Countroom

Reviewed by: _____
 Supervisor

Laboratory: AAA

ORTEC g v - i (3263) Env32 G800W064 9/21/2023 7:56:51 AM
 AAA Spectrum name: ARS06962.An1

Sample description

Batch ID: Long Bkg
 SDG ID: Tech: CDW

Spectrum Filename: C:\User\ARS06962.An1

Acquisition information

Start time: 9/20/2023 2:33:28 PM
 Live time: 60000
 Real time: 60039
 Dead time: 0.06 %
 Detector ID: 21

Detector system

ARS06 MCB 133

Calibration

Filename: 2199-26-1 250mL jar cal 7-6-21.Clb
 2199-26-1 250mL jar
 EEC 7-6-21

Energy Calibration

Created: 7/6/2021 3:23:54 PM
 Zero offset: 0.147 keV
 Gain: 0.250 keV/channel
 Quadratic: -3.188E-08 keV/channel^2

Efficiency Calibration

Created: 7/7/2021 6:24:21 AM
 Knee Energy: 130.00 keV
 Above the Knee: Quadratic Uncertainty = 1.54 %
 Log(Eff): $-1.869416E+00 + (-3.968678E-02 * \text{Log}(E)) + (-5.049798E-02 * \text{Log}(E)^2)$
 Below the Knee: Quadratic Uncertainty = 2.03 %
 Log(Eff): $-1.168008E+01 + (3.811151E+00 * \text{Log}(E)) + (-4.269526E-01 * \text{Log}(E)^2)$

Library Files

Main analysis library: NORM.Lib
 Library Match Width: 0.500
 Peak stripping: Library based

Analysis parameters

Analysis engine: Env32 G800W064
 Start channel: 120 (30.15keV)
 Stop channel: 8000 (1998.06keV)
 Peak rejection level: 40.000%
 Peak search sensitivity: 1
 Sample Size: 1.0000E+00 +/- 0.000E+00%
 Activity scaling factor: $1.0000E+06 / (1.0000E+00 * 1.0000E+00) = 1.0000E+06$
 Detection limit method: Reg. Guide 4.16 Method

ORTEC g v - i (3263) Env32 G800W064 9/21/2023 7:56:51 AM
 AAA Spectrum name: ARS06962.An1

Random error: 1.0000000E+00
 Systematic error: 1.0000000E+00
 Fraction Limit: 0.000%
 Background width: best method (based on spectrum).
 Half lives decay limit: 12.000
 Activity range factor: 2.000
 Min. step backg. energy 0.000
 Multiplet shift channel 2.000

Corrections	Status	Comments
Decay correct to date:	NO	
Decay during acquisition:	YES	
Decay during collection:	NO	
True coincidence correction:	NO	
Peaked background correction:	YES	norm.Pbc 8/21/2023 8:35:50 AM
Absorption (Internal):	NO	
Geometry correction:	NO	
Random summing:	NO	

total peaks alloc. 0 cutoff: 0.00E+00 %
 Energy Calibration
 Normalized diff: 0.0741

***** S U M M A R Y O F P E A K S I N R A N G E *****								
Peak Energy	Area	Uncert	FWHM	Corrctn Factor	Nuclide Energy	Brnch. Ratio	Act. pCi/g	Nuc
35.66	200.	30.19	0.66	2.980E-02				
44.44	297.	16.71	1.29	3.458E-02				
140.32	108.	35.33	1.61	3.689E-02				
198.20	141.	29.65	0.48	3.046E-02				
510.95	2196.	3.91	2.54	1.690E-02	510.72	22.500	2.602E+02	TL208
558.73	130.	24.56	1.20	1.590E-02				
694.70	115.	34.57	4.41	1.369E-02				
898.89	61.	32.26	1.47	1.139E-02	898.60	4.000	6.021E+01	PA234
962.46	94.	28.64	0.40	1.083E-02				
1043.31	73.	35.14	0.32	1.021E-02				
1063.51	56.	29.87	1.95	1.007E-02				
1067.72	54.	31.74	1.96	1.004E-02				
1210.69	75.	27.49	1.11	9.125E-03	1210.00	17.000	2.175E+01	TL210
1326.85	52.	34.10	1.22	8.517E-03				
1460.92	56.	32.29	1.24	7.908E-03	1460.75	10.700	2.954E+01	K40
1764.72	96.	15.73	1.27	6.818E-03	1764.49	15.357	4.130E+01	BI214

ORTEC g v - i (3263) Env32 G800W064 9/21/2023 7:56:51 AM
 AAA Spectrum name: ARS06962.An1

***** U N I D E N T I F I E D P E A K S U M M A R Y *****

Peak Centroid Channel	Background Energy	Net Area Counts	Efficiency Counts	Uncert * Area	FWHM 2 Sigma %	Suspected keV	Nuclide
142.06	35.63	1492.	200.	6.698E+03	60.39	0.662	- sM
177.20	44.57	903.	297.	8.590E+03	33.43	1.289	- sM
560.76	140.32	544.	108.	2.941E+03	70.67	1.611	- sM
792.33	197.97	614.	141.	4.616E+03	59.30	0.479	- sM
2043.78	510.87	760.	2196.	1.300E+05	7.81	2.537	- sM
2235.02	558.79	269.	130.	8.168E+03	49.12	1.200	- sM
2779.27	694.70	397.	115.	8.409E+03	69.15	4.409	- sM
3596.71	899.00	112.	61.	5.348E+03	64.52	1.466	- sM
3851.23	962.61	170.	94.	8.668E+03	57.28	0.401	- sM
4174.99	1043.77	154.	73.	7.153E+03	70.29	0.325	- sM
4255.85	1063.29	114.	56.	5.602E+03	59.74	1.955	- sD
4272.72	1067.50	119.	54.	5.361E+03	63.47	1.958	- sD
4845.29	1211.86	100.	75.	8.219E+03	54.97	1.106	- sM
5310.53	1326.83	75.	52.	6.106E+03	68.21	1.223	- sM
5847.58	1460.85	80.	56.	7.988E+03	64.58	1.237	- l
7064.84	1764.68	33.	96.	1.408E+04	31.46	1.265	- sM

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 L - Peak written from unknown list.
 C - Area < Critical level.
 M - Peak is close to a library peak.

 This section based on library: NORM.Lib

***** I D E N T I F I E D P E A K S U M M A R Y *****

Nuclide	Peak	Centroid	Background	Net Area	Intensity	Uncert	FWHM
	Channel	Energy	Counts	Counts	Cts/Sec	2 Sigma %	keV

s - Peak fails shape tests.
 D - Peak area deconvoluted.
 A Derived peak area.

***** S U M M A R Y O F L I B R A R Y P E A K U S A G E *****

- Nuclide - Name	Code	Average Activity pCi/g	Energy keV	Peak Activity pCi/g	Code	MDA Value pCi/g	COMMENTS
RA-226		-1.7200E+01					
			186.10-1.720E+01	&(	5.772E+01	1.33E+02	5.84E+05 3.50E+00 G

ORTEC g v - i (3263) Env32 G800W064 9/21/2023 7:56:51 AM
 AAA Spectrum name: ARS06962.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
Ra-228	-3.6728E-02					2.10E+03	
		911.07	3.673E-02	%	1.131E+01	1.45E+04	2.90E+01 G
		968.90	5.982E-01	%	2.440E+01	1.21E+03	1.75E+01 G
		338.40	2.039E+00	%	1.986E+01	4.01E+02	1.20E+01 G
		964.60	2.070E+01	%	6.513E+01	9.44E+01	5.45E+00 G
PB-210	-1.1982E+01					7.45E+03	
		46.52	1.198E+01	%	6.615E+01	1.66E+02	4.00E+00 G
U-238	-1.6160E+01					1.63E+12	
		63.29	1.616E+01	%	4.416E+01	1.03E+02	3.90E+00 G
		92.80	1.428E+01	%	4.999E+01	1.39E+02	3.00E+00 G
		92.38	2.121E+01	%	6.025E+01	1.13E+02	2.57E+00 G
U-235	6.1582E+00					1.39E+09	
		143.76	6.158E+00	%	2.059E+01	1.01E+02	1.05E+01 G
		205.31	1.510E+01	&	4.182E+01	1.10E+02	4.70E+00 G
		163.35	3.294E+00	&	4.036E+01	4.83E+02	4.70E+00 G
K-40	-1.4018E+01					4.68E+11	
		1460.75	1.402E+01	%	3.942E+01	1.46E+02	1.07E+01 G
PB-214	8.7654E-01					5.84E+05	
		351.92	8.765E-01	%	6.795E+00	3.19E+02	3.58E+01 G
		295.21	6.060E+00	%	1.444E+01	9.90E+01	1.85E+01 G
		241.98	7.982E+00	%	3.158E+01	1.64E+02	7.50E+00 G
BI-214	-7.5191E+00					5.84E+05	
		609.31	7.519E+00	%	7.928E+00	6.19E+01	4.48E+01 G
		1764.49	8.031E+00	%	2.673E+01	9.94E+01	1.54E+01 G
		1120.29	7.023E+00	%	2.207E+01	1.54E+02	1.48E+01 G
		1238.11	3.194E+01	%	5.076E+01	7.81E+01	5.86E+00 G
		768.36	1.473E+00	%	6.299E+01	1.96E+03	4.80E+00 G
		1377.67	1.389E+01	%	7.981E+01	2.85E+02	3.92E+00 G
		934.06	2.014E+01	%	9.497E+01	2.23E+02	3.03E+00 G
				(P			
BI-212	8.9279E+00					2.10E+03	
		727.17	8.928E+00	&	2.304E+01	1.19E+02	1.18E+01 G
		1620.56	6.738E+00	&	1.178E+02	8.86E+02	2.75E+00 G
		785.42	8.771E+01	%	1.591E+02	8.42E+01	2.00E+00 G
PB-212	1.5943E-01					2.10E+03	
		238.63	1.594E-01	&	5.274E+00	1.36E+03	4.31E+01 G
		300.09	3.249E+01	%	7.460E+01	9.54E+01	3.27E+00 G

ORTEC g v - i (3263) Env32 G800W064 9/21/2023 7:56:51 AM
 AAA Spectrum name: ARS06962.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
RA-223	3.7814E+00						1.20E+07
		269.39	3.781E+00	&(	1.693E+01	1.85E+02	1.36E+01 G
		154.18	-1.378E+01	&	3.535E+01	1.02E+02	5.59E+00 G
		323.88	-8.062E+00	%	6.040E+01	3.09E+02	3.90E+00 G
RA-224	-2.0842E+01						2.10E+03
		241.00	-2.084E+01	% (	6.104E+01	1.22E+02	3.90E+00 G
TL-208	-1.8976E+00						2.10E+03
		583.14	-1.898E+00	% (	3.736E+00	8.84E+01	8.60E+01 G
		510.72	-1.603E+00	%	3.081E+01	5.78E+02	2.25E+01 G
		860.47	-1.435E+01	&	2.775E+01	8.97E+01	1.20E+01 G
		277.36	1.111E+00	%	3.567E+01	1.32E+03	6.50E+00 G
		763.30	-2.276E+01	%	1.655E+02	3.33E+02	1.70E+00 G
TL-210	-1.8305E+00						5.84E+05
		795.00	-1.831E+00	&(	3.299E+00	8.37E+01	1.00E+02 G
		296.00	5.609E-01	%	2.889E+00	2.13E+02	8.00E+01 G
		1310.00	3.991E+00	%	1.491E+01	1.87E+02	2.10E+01 G
		1210.00	-1.005E+01	&	2.331E+01	7.01E+01	1.70E+01 G
		1110.00	7.922E+00	&	4.573E+01	2.81E+02	7.00E+00 G
		860.00	-2.435E+01	%	5.026E+01	9.57E+01	7.00E+00 G
		1410.00	-1.884E+01	%	7.345E+01	1.95E+02	5.00E+00 G
BE-7	1.0481E+01						5.34E+01
		477.56	1.048E+01	% (	2.156E+01	8.86E+01	1.03E+01 G
NA-22	-1.2830E+00						9.50E+02
		1274.54	-1.283E+00	% (	3.605E+00	1.41E+02	9.99E+01 G
PA-234	-1.7800E+00						1.65E+12
		98.44	-1.780E+00	&(	6.054E+00	1.35E+02	2.51E+01 G
		946.00	-9.257E+00	%	1.788E+01	9.25E+01	2.00E+01 G
		131.28	3.052E+00	%	7.797E+00	1.01E+02	2.00E+01 G
		94.67	-7.209E-01	&	9.507E+00	5.20E+02	1.55E+01 G
		883.24	1.085E+00	%	2.651E+01	1.15E+03	1.20E+01 G
		926.70	5.760E+00	&	2.694E+01	2.21E+02	1.10E+01 G
		569.26	-1.522E+01	%	3.371E+01	9.95E+01	1.04E+01 G
		111.00	-2.803E+00	%	1.794E+01	2.53E+02	8.55E+00 G
		733.00	-6.433E+00	&	3.518E+01	2.51E+02	8.50E+00 G
		949.00	-8.655E+00	%	3.955E+01	2.16E+02	7.80E+00 G
		880.51	-8.892E+00	&	5.174E+01	2.76E+02	6.50E+00 G
		226.87	-1.354E+01	%	3.281E+01	9.63E+01	6.50E+00 G
		831.10	-2.191E+01	%	5.557E+01	1.17E+02	5.60E+00 G
		808.10	-3.504E+01	%	7.204E+01	9.54E+01	4.90E+00 G
		99.70	-2.428E+00	&	3.142E+01	5.10E+02	4.70E+00 G
		699.10	-4.007E+01	%	1.042E+02	7.86E+01	4.60E+00 G

ORTEC g v - i (3263) Env32 G800W064 9/21/2023 7:56:51 AM
 AAA Spectrum name: ARS06962.An1

Nuclide	Ave activity	Energy	Activity	Code	Peak	MDA	Comments
		898.60	4.738E+01 %	9.132E+01	5.86E+01	4.00E+00	G
		1394.10	2.254E+01 &	7.012E+01	1.54E+02	3.90E+00	G
IR-192	-7.3839E-01				7.40E+01		
		316.49	7.384E-01 &(	2.767E+00	1.55E+02	8.70E+01	G K
		468.06	1.069E+00 %	4.823E+00	1.93E+02	5.18E+01	G K
		308.44	2.973E+00 %	7.751E+00	1.08E+02	3.18E+01	G K
		604.40	2.043E+01 %	4.142E+01	9.12E+01	8.90E+00	G K
		612.45	3.180E+01 %	6.654E+01	9.41E+01	5.80E+00	G K
		588.60	2.337E+01 %	6.308E+01	1.21E+02	4.60E+00	G K
		205.78	2.495E+01 %	6.055E+01	9.64E+01	3.49E+00	G
		484.54	1.434E+01 &	7.318E+01	2.18E+02	3.35E+00	G
SC-46	-6.8693E-01				8.38E+01		
		889.26	6.869E-01 &(	3.001E+00	2.07E+02	1.00E+02	G
TL-201	-1.4170E+00				3.06E+00		
		70.82	1.417E+00 &(	3.812E+00	1.02E+02	4.90E+01	G
		68.89	2.567E+00 %	6.911E+00	1.02E+02	2.89E+01	G
		80.20	2.373E+00 %	1.017E+01	1.62E+02	1.69E+01	G
		167.43	6.640E+00 %	1.643E+01	9.83E+01	1.19E+01	G

(- This peak used in the nuclide activity average.

- * - Peak is too wide, but only one peak in library.
- ! - Peak is part of a multiplet and this area went negative during deconvolution.
- ? - Peak is too narrow.
- @ - Peak is too wide at FW25M, but ok at FWHM.
- % - Peak fails sensitivity test.
- \$ - Peak identified, but first peak of this nuclide failed one or more qualification tests.
- + - Peak activity higher than counting uncertainty range.
- - Peak activity lower than counting uncertainty range.
- = - Peak outside analysis energy range.
- & - Calculated peak centroid is not close enough to the library energy centroid for positive identification.
- P - Peakbackground subtraction
- } - Peak is too close to another for the activity to be found directly.

Nuclide Codes:

T - Thermal Neutron Activation
 F - Fast Neutron Activation
 I - Fission Product
 N - Naturally Occurring Isotope
 P - Photon Reaction
 C - Charged Particle Reaction
 M - No MDA Calculation

Peak Codes:

G - Gamma Ray
 X - X-Ray
 P - Positron Decay
 S - Single-Escape
 D - Double-Escape
 K - Key Line
 A - Not in Average

ORTEC g v - i (3263) Env32 G800W064 9/21/2023 7:56:51 AM
 AAA Spectrum name: ARS06962.An1

R - Coincidence Corrected C - Coincidence Peak
 H - Halflife limit exceeded

***** D I S C A R D E D I S O T O P E P E A K S *****

Nuclide	Centroid Energy	Background Counts	Net Area Counts	Intensity Cts/Sec	Uncert 2 Sigma	Activity %
---------	--------------------	----------------------	--------------------	----------------------	-------------------	---------------

P - Peakbackground subtraction

***** S U M M A R Y O F N U C L I D E S I N S A M P L E *****

Nuclide	Time of Count Activity pCi/g	Uncertainty Counting pCi/g	2 Sigma Total pCi/g	MDA pCi/g
---------	------------------------------------	----------------------------------	---------------------------	--------------

RA-226 #A	-1.7200E+01	4.5767E+01	4.5780E+01	0.577E+02
Ra-228 #A	-3.6728E-02	1.0669E+01	1.0669E+01	0.113E+02
PB-210 #A	-1.1982E+01	3.9817E+01	3.9832E+01	0.661E+02
U-238 #A	-1.6160E+01	3.3412E+01	3.3432E+01	0.442E+02
U-235 #A	6.1582E+00	1.2420E+01	1.2432E+01	0.206E+02
K-40 #A	-1.4018E+01	4.0839E+01	4.0849E+01	0.394E+02
PB-214 #A	8.7654E-01	5.5952E+00	5.5957E+00	0.680E+01
BI-214 #A	-7.5191E+00	9.3057E+00	9.3166E+00	0.793E+01
BI-212 #A	8.9279E+00	2.1243E+01	2.1250E+01	0.230E+02
PB-212 #A	1.5943E-01	4.3475E+00	4.3475E+00	0.527E+01
RA-223 #A	3.7814E+00	1.3998E+01	1.4000E+01	0.169E+02
RA-224 #A	-2.0842E+01	5.0678E+01	5.0697E+01	0.610E+02
TL-208 #A	-1.8976E+00	3.3562E+00	3.3584E+00	0.374E+01
TL-210 #A	-1.8305E+00	3.0640E+00	3.0660E+00	0.330E+01
BE-7 #A	1.0481E+01	1.8579E+01	1.8591E+01	0.216E+02
NA-22 #A	-1.2830E+00	3.6290E+00	3.6299E+00	0.360E+01
PA-234 #A	-1.7800E+00	4.7990E+00	4.8007E+00	0.605E+01
IR-192 #B	-7.3839E-01	2.2886E+00	2.2891E+00	0.277E+01
SC-46 #A	-6.8693E-01	2.8433E+00	2.8436E+00	0.300E+01
TL-201 #A	-1.4170E+00	2.8854E+00	2.8874E+00	0.381E+01

- All peaks for activity calculation had bad shape.
 * - Activity omitted from total
 & - Activity omitted from total and all peaks had bad shape.
 < - MDA value printed.
 A - Activity printed, but activity < MDA.
 B - Activity < MDA and failed test.
 C - Area < Critical level.
 F - Failed fraction or key line test.
 H - Halflife limit exceeded

----- S U M M A R Y -----
 Total Activity (30.1 to 1998.1 keV) 0.000E+00 pCi/g

Analyzed by: _____
 Countroom

ORTEC g v - i (3263) Env32 G800W064 9/21/2023 7:56:51 AM
AAA Spectrum name: ARS06962.An1

Reviewed by: _____
Supervisor

Laboratory: AAA



ARS Aleut Analytical, LLC Analytical Reports

for

GES-AIS, LLC

Sr-90 - Raw Data

Analytical Batch Report

Analysis Batch ID **ARS1-B23-01624**Procedure **PALA-RAD-032**Analysis **GPC-SR90-SO**Prep **N/A**Description **Strontium-90 in (Soil, Sludge, Biota, Sediment [SO, BI, VG])**

ABatch Sample ID	Type	Blinds	SDG	FR	Run	Matrix	Holding Deadline	Client ID	Group Name	Lab Deadline
ARS1-B23-01624-01	LCS						9:22			
ARS1-B23-01624-02	LCSD						9:24			
ARS1-B23-01624-03	MBL						9:26			
ARS1-B23-01624-04	TRG		ARS1-23-01973	003	1	SO	9:28	HPPC-ESU-315A-033	Parcel C Rad Sampling	10/02/23
ARS1-B23-01624-05	DUP		Parent: ARS1-23-01973-003				9:32			
ARS1-B23-01624-06	TRG		ARS1-23-01973	004	1	SO	9:28	HPPC-ESU-315A-033-FD	Parcel C Rad Sampling	10/02/23

019.13.23

ARS Aleut Analytical, LLC
Port Allen Laboratory**LCS Report**
Analytical Batch: ARS1-B23-01624Printed: 9/19/2023 2:13 PM
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Blind ID	ABatch Sample ID	Blind Group	Std ID	Isotope	Exp Addition (g)	Expected Value (pCi/g)	Empty Wt (g)	Gross Wt (g)	Net Wt (g)	Expected Value CT (pCi/g)	Mid Point Count Date	Known Value (pCi)	User ID	Mod Date
B-33266	ARS1-B23-01624-01	B-Sr90	S-0370	Sr-90	1	19.63025	127.238	128.26	1.0220	19.62114	09/13/2023	20.05280	KEASTMAN	09/12/2023
B-33267	ARS1-B23-01624-02	B-Sr90	S-0370	Sr-90	1	19.63025	124.662	125.678	1.0160	19.62114	09/13/2023	19.93507	KEASTMAN	09/12/2023

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PALA-RAD-032

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Page 1 of 5**Strontium 89, 90 and Total Strontium in Water, Soil and Vegetation Matrices by
Eichrom Resin Separation**

Preparation Date: 09/12/2023 07:27

Prepared By: DWILLIAMS

Procedure Data												
ABatch Sample ID	Type	SDG/Fraction	ICOC ID	Aliquot Vol/Wt	Aliquot Units	Strontium Carrier (5mg/ml)	Strontium Verified Mass (mg)	Y Ingrowth Date 1	Disk Wt (g)	Disk Wt 2 (g)	Net Disk Wt (mg)	% Recovery
ARS1-B23-01624-01	LCS			1.0000	g	R23-00294	11.8200	9/13/2023 9:22:00 AM	7.6471	7.6584	11.3000	95.6007
ARS1-B23-01624-02	LCSD			1.0000	g	R23-00294	11.8200	9/13/2023 9:24:00 AM	7.6511	7.6623	11.2000	94.7547
ARS1-B23-01624-03	MBL			3.0090	g	R23-00294	11.8200	9/13/2023 9:26:00 AM	7.6741	7.6849	10.8000	91.3706
ARS1-B23-01624-04	TRG	ARS1-23-01973-003	447712	3.0110	g	R23-00294	11.8200	9/13/2023 9:28:00 AM	7.6647	7.6756	10.9000	92.2166
ARS1-B23-01624-05	DUP	ARS1-23-01973-003		3.0050	g	R23-00294	11.8200	9/13/2023 9:32:00 AM	7.6704	7.6815	11.1000	93.9086
ARS1-B23-01624-06	TRG	ARS1-23-01973-004	447713	3.0100	g	R23-00294	11.8200	9/13/2023 9:28:00 AM	7.6620	7.6729	10.9000	92.2166

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Port Allen Laboratory

PALA-RAD-032

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**Strontium 89, 90 and Total Strontium in Water, Soil and Vegetation Matrices by
Eichrom Resin Separation**

Procedure Data			
ABatch Sample ID	Type	Pass/Fail	Y Ingrowth Date 2
ARS1-B23-01624-01	LCS	PASS	
ARS1-B23-01624-02	LCSD	PASS	
ARS1-B23-01624-03	MBL	PASS	
ARS1-B23-01624-04	TRG	PASS	
ARS1-B23-01624-05	DUP	PASS	
ARS1-B23-01624-06	TRG	PASS	

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**Strontium 89, 90 and Total Strontium in Water, Soil and Vegetation Matrices by
Eichrom Resin Separation**

Reagent Amounts			
ABatch Sample ID	Type	SDG/Fraction	14.3.4. Condition Sr Column - Nitric Acid 8N (mL)
ARS1-B23-01624-01	LCS		5.00
ARS1-B23-01624-02	LCSD		5.00
ARS1-B23-01624-03	MBL		5.00
ARS1-B23-01624-04	TRG	ARS1-23-01973-003	5.00
ARS1-B23-01624-05	DUP	ARS1-23-01973-003	5.00
ARS1-B23-01624-06	TRG	ARS1-23-01973-004	5.00

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Page 4 of 5**Strontium 89, 90 and Total Strontium in Water, Soil and Vegetation Matrices by
Eichrom Resin Separation**

Reagent Tracking	
Procedure Section	Reagent ID
14.0. Leach Solid Sample-A	R23-00441
14.0. Leach Solid Sample-B	R23-00545
14.1.4. Add Carrier	R23-00294
14.3.1. Set Up Vacuum Box System	R23-00498
14.3.4. Condition Sr Column	R23-00601
14.4.1. Dissolve Residue in Load Solution	R23-00671
14.4.3. Beaker Rinse	R23-00671
14.4.4. Elute Interferants	R23-00605
14.4.5. Final Column Rinse	R23-00671
14.4.8. Elute Strontium	R23-00606
14.6.6. Rinse Collection Tube	R23-00606

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Page 5 of 5**Strontium 89, 90 and Total Strontium in Water, Soil and Vegetation Matrices by
Eichrom Resin Separation**


Support Equipment		
Equipment Type	Serial/ Batch/ Lot	Comments
Balance	B738690243 (Wet Lab)	
Balance	T0350192 (Soil LAB)	
Eichrom Outer Tip	23032441161	
Eichrom Support Tube	23013040521	
Fume Hood	030807173-B (WET LAB)	
Hot Block	#11 SN 143475 (Radiochem)	
Pipette	SH39912	
Pipette Tip	5mL Finn 22220L0	
Planchette	Lot 08-03-2023 (2 inch)	
QC Sand	R23-00057	
Pipette	5mL Finn 22220L0	

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Port Allen Laboratory


Calculation Report

ARS1-B23-01624

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	Analytical Batch ID		ARS1-B23-01624												
	Analysis Code		GPC-SR90-SO												
	Procedure No		PALA-RAD-032												
	Matrix		Soil/Solid/Sludge												
ABatch Sample ID	Sample Type	SDG	Fracton	Client ID	Run	Isotope	ACT	CSU 1s	CSU 2s	MDA	DLC	CU 1s	CU 2s	MCL	Result Units
ARS1-B23-01624-01	LCS					SR-90	22.03883	1.71931	3.36984	0.38785	0.17815	0.51791	1.01510		pCi/g
ARS1-B23-01624-01	LCS					Sr	0.01130								g
ARS1-B23-01624-02	LCSD					SR-90	20.04430	1.56700	3.07133	0.37003	0.17004	0.48187	0.94446		pCi/g
ARS1-B23-01624-02	LCSD					Sr	0.01120								g
ARS1-B23-01624-03	MBL					SR-90	0.16647	0.05598	0.10973	0.16950	0.07950	0.05460	0.10701		pCi/g
ARS1-B23-01624-03	MBL					Sr	0.01080								g
ARS1-B23-01624-04	TRG	ARS1-23-01973	003	HPPC-ESU-315A-033	1	SR-90	-0.00363	0.03930	0.07703	0.14042	0.06494	0.03930	0.07703		pCi/g
ARS1-B23-01624-04	TRG	ARS1-23-01973	003	HPPC-ESU-315A-033	1	Sr	0.01090								g
ARS1-B23-01624-05	DUP					SR-90	0.06317	0.04151	0.08136	0.13606	0.06270	0.04125	0.08084		pCi/g
ARS1-B23-01624-05	DUP					Sr	0.01110								g
ARS1-B23-01624-06	TRG	ARS1-23-01973	004	HPPC-ESU-315A-033-FD	1	SR-90	0.13013	0.04415	0.08654	0.13151	0.06053	0.04308	0.08444		pCi/g
ARS1-B23-01624-06	TRG	ARS1-23-01973	004	HPPC-ESU-315A-033-FD	1	Sr	0.01090								g

ARS Aleut Analytical, LLC
Port Allen LaboratoryCalculation Report
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		Analytical Batch ID ARS1-B23-01624											
		Analysis Code GPC-SR90-SO											
		Procedure No PALA-RAD-032											
		Matrix Soil/Solid/Sludge											
ABatch Sample ID	Sample Type	SDG	Fracton	Tracer Recovery	Chem Recovery	Sample Counts	Sample Count Mins	BKG Counts	BKG Count Mins	EFF	ALIQ	Sample Coll Date	Mid Point Count Date
ARS1-B23-01624-01	LCS				95.6%	1970.000000	120	573.000000	900	0.32770	1	9/12/2023	9/13/2023
ARS1-B23-01624-01	LCS										1	9/12/2023	9/13/2023
ARS1-B23-01624-02	LCSD				94.8%	1891.000000	120	579.000000	900	0.34832	1	9/12/2023	9/13/2023
ARS1-B23-01624-02	LCSD										1	9/12/2023	9/13/2023
ARS1-B23-01624-03	MBL				91.4%	180.000000	120	1028.000000	900	0.34220	3.009	9/12/2023	9/13/2023
ARS1-B23-01624-03	MBL										3.009	9/12/2023	9/13/2023
ARS1-B23-01624-04	TRG	ARS1-23-01973	003		92.2%	90.000000	120	682.000000	900	0.33795	3.011	9/6/2023	9/13/2023
ARS1-B23-01624-04	TRG	ARS1-23-01973	003								3.011	9/6/2023	9/13/2023
ARS1-B23-01624-05	DUP				93.9%	99.000000	120	622.000000	900	0.32914	3.005	9/6/2023	9/13/2023
ARS1-B23-01624-05	DUP										3.005	9/6/2023	9/13/2023
ARS1-B23-01624-06	TRG	ARS1-23-01973	004		92.2%	114.000000	120	602.000000	900	0.34079	3.01	9/6/2023	9/13/2023
ARS1-B23-01624-06	TRG	ARS1-23-01973	004								3.01	9/6/2023	9/13/2023

ARS Aleut Analytical, LLC
Port Allen Laboratory


Calculation Report

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		Analytical Batch ID ARS1-B23-01624												
		Analysis Code GPC-SR90-SO												
		Procedure No PALA-RAD-032												
		Matrix Soil/Solid/Sludge												
ABatch Sample ID	Sample Type	SDG	Fracton	UCF	ACF	Gross Count Rate	BKG Count Rate	Net Count Rate	Plating Recovery	Detector ID	Instrument keV	Nuclide Abundance	Tracer Isotope	Tracer Ref Date
ARS1-B23-01624-01	LCS			2.22	1	16.41667	0.63667	15.78000	1	A3				
ARS1-B23-01624-01	LCS			2.22	1				1					
ARS1-B23-01624-02	LCSD			2.22	1	15.75833	0.64333	15.11500	1	A4				
ARS1-B23-01624-02	LCSD			2.22	1				1					
ARS1-B23-01624-03	MBL			2.22	1	1.50000	1.14222	0.35778	1	B1				
ARS1-B23-01624-03	MBL			2.22	1				1					
ARS1-B23-01624-04	TRG	ARS1-23-01973	003	2.22	1	0.75000	0.75778	-0.00778	1	B2				
ARS1-B23-01624-04	TRG	ARS1-23-01973	003	2.22	1				1					
ARS1-B23-01624-05	DUP			2.22	1	0.82500	0.69111	0.13389	1	B3				
ARS1-B23-01624-05	DUP			2.22	1				1					
ARS1-B23-01624-06	TRG	ARS1-23-01973	004	2.22	1	0.95000	0.66889	0.28111	1	B4				
ARS1-B23-01624-06	TRG	ARS1-23-01973	004	2.22	1				1					


ARS Aleut Analytical, LLC
Port Allen Laboratory**Calculation Report**
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		Analytical Batch ID		ARS1-B23-01624											
		Analysis Code		GPC-SR90-SO											
		Procedure No		PALA-RAD-032											
		Matrix		Soil/Solid/Sludge											
ABatch Sample ID	Sample Type	SDG	Fracton	Halfliife1	Halfliife2	Halfliife3	Delta T1	Delta T2	Delta T3	DF1	DF2	DF3	DF4	IF1	IF2
ARS1-B23-01624-01	LCS			2.66667			0.11528							1.02952	
ARS1-B23-01624-01	LCS														
ARS1-B23-01624-02	LCSD			2.66667			0.11389							1.02917	
ARS1-B23-01624-02	LCSD														
ARS1-B23-01624-03	MBL			2.66667			0.11319							1.02899	
ARS1-B23-01624-03	MBL														
ARS1-B23-01624-04	TRG	ARS1-23-01973	003	2.66667			0.11181							1.02864	
ARS1-B23-01624-04	TRG	ARS1-23-01973	003												
ARS1-B23-01624-05	DUP			2.66667			0.10903							1.02794	
ARS1-B23-01624-05	DUP														
ARS1-B23-01624-06	TRG	ARS1-23-01973	004	2.66667			0.11181							1.02864	
ARS1-B23-01624-06	TRG	ARS1-23-01973	004												

ARS Aleut Analytical, LLC
Port Allen Laboratory**Calculation Report**
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		Analytical Batch ID ARS1-B23-01624													
		Analysis Code GPC-SR90-SO													
		Procedure No PALA-RAD-032													
		Matrix Soil/Solid/Sludge													
ABatch Sample ID	Sample Type	SDG	Fracton	TPU F1	TPU F2	TPU F3	TPU F4	TPU F5	TPU F6	Sys Err	K Val	K MDA	BP_DL	BP_MDC	Sb
ARS1-B23-01624-01	LCS			0.04133	0.02	0.05831	0.00505	0	0	0.07439	0.71601	85.92110			
ARS1-B23-01624-01	LCS			0.04133	0.02	0.05831	0.00505	0	0						
ARS1-B23-01624-02	LCSD			0.04133	0.02	0.05831	0.00505	0	0	0.07439	0.75408	90.48956			
ARS1-B23-01624-02	LCSD			0.04133	0.02	0.05831	0.00505	0	0						
ARS1-B23-01624-03	MBL			0.04133	0.02	0.05831	0.00505	0	0	0.07439	2.14921	257.90465			
ARS1-B23-01624-03	MBL			0.04133	0.02	0.05831	0.00505	0	0						
ARS1-B23-01624-04	TRG	ARS1-23-01973	003	0.04133	0.02	0.05831	0.00505	0	0	0.07439	2.14287	257.14477			
ARS1-B23-01624-04	TRG	ARS1-23-01973	003	0.04133	0.02	0.05831	0.00505	0	0						
ARS1-B23-01624-05	DUP			0.04133	0.02	0.05831	0.00505	0	0	0.07439	2.11959	254.35090			
ARS1-B23-01624-05	DUP			0.04133	0.02	0.05831	0.00505	0	0						
ARS1-B23-01624-06	TRG	ARS1-23-01973	004	0.04133	0.02	0.05831	0.00505	0	0	0.07439	2.16015	259.21810			
ARS1-B23-01624-06	TRG	ARS1-23-01973	004	0.04133	0.02	0.05831	0.00505	0	0						

ARS Aleut Analytical, LLC
Port Allen Laboratory**Calculation Report**
ARS1-B23-01624Printed: 9/19/2023 2:13 PM
Page 6 of 6

		Analytical Batch ID		ARS1-B23-01624					
		Analysis Code		GPC-SR90-SO					
		Procedure No		PALA-RAD-032					
		Matrix		Soil/Solid/Sludge					
ABatch Sample ID	Sample Type	SDG	Fracton	Qualifier	Expected Result	Percent Recovery	RPD	RER	DER
ARS1-B23-01624-01	LCS				20.05280	109.9%			
ARS1-B23-01624-01	LCS				0.01182	95.6%			
ARS1-B23-01624-02	LCSD				19.93507	100.5%	9.5%	0.60692	0.85739
ARS1-B23-01624-02	LCSD				0.01182	94.8%			
ARS1-B23-01624-03	MBL			U					
ARS1-B23-01624-03	MBL				0.01182	91.4%			
ARS1-B23-01624-04	TRG	ARS1-23-01973	003	U					
ARS1-B23-01624-04	TRG	ARS1-23-01973	003		0.01182	92.2%			
ARS1-B23-01624-05	DUP			U				0.82656	1.16850
ARS1-B23-01624-05	DUP				0.01182	93.9%			
ARS1-B23-01624-06	TRG	ARS1-23-01973	004	U					
ARS1-B23-01624-06	TRG	ARS1-23-01973	004		0.01182	92.2%			



Assignment Summary

Drawer	Batch ID	Detector	Batch	Sample	Procedure	Standard	Count Time	Run Date & Time
LB 4200 A	8537	A3	B23-01624	23-01624-01	Sr-90, Sr-89/90		7200	9/13/2023 11:08:23 AM
LB 4200 A	8537	A4	B23-01624	23-01624-02	Sr-90, Sr-89/90		7200	9/13/2023 11:08:23 AM
LB 4200 B	8537	B1	B23-01624	23-01624-03	Sr-90, Sr-89/90		7200	9/13/2023 11:08:23 AM
LB 4200 B	8537	B2	B23-01624	23-01624-04	Sr-90, Sr-89/90		7200	9/13/2023 11:08:23 AM
LB 4200 B	8537	B3	B23-01624	23-01624-05	Sr-90, Sr-89/90		7200	9/13/2023 11:08:23 AM
LB 4200 B	8537	B4	B23-01624	23-01624-06	Sr-90, Sr-89/90		7200	9/13/2023 11:08:23 AM

GPC D 1155921 Batch Report

Batch Name: B23-01624

Calibration: Fitted Efficiency

Procedure: Sr-90, Sr-89/90

Preset Count Time (min): 120

Batch ID: 8537

Count Mode: Simultaneous

Sample ID	Detector ID	Gross Alpha Counts (cpm)	Gross Beta Counts (cpm)	Alpha activity (uCi)	Beta activity (uCi)	Count Time (s)	Voltage (V)	Run Date & Time
23-01624-01	A3	38	1970	0.25209370710514	41.2444222043186	7200	1230	9/13/2023 11:08:32 AM
23-01624-02	A4	42	1891	0.30425740171575	39.7221810265689	7200	1230	9/13/2023 11:08:32 AM
23-01624-03	B1	22	180	0.87018190096630	3.68764576432893	7200	1230	9/13/2023 11:08:32 AM
23-01624-04	B2	16	90	0.67768097743269	1.79394653502855	7200	1230	9/13/2023 11:08:32 AM
23-01624-05	B3	14	99	0.59275017115421	2.02159807257009	7200	1230	9/13/2023 11:08:32 AM
23-01624-06	B4	12	114	0.47030405320868	2.33136906825801	7200	1230	9/13/2023 11:08:32 AM

Date	Time	Batch ID	Fraction	Procedure	Gen File	Detector	Tech
09-12-2023	15:02	23-01615	5	GAGB	8524	C1	SDW
09-12-2023	15:02	23-01615	6	GAGB	8524	C2	SDW
09-12-2023	15:02	23-01615	7	GAGB	8524	C3	SDW
09-13-2023	7:08	Daily	QA	bkg	8525- 8528	all	SDW
09-13-2023	9:23	Daily	QA	eff	8529- 8536	all	SDW
09-13-2023	11:08	23-01624	1	Sr-90	8537	A3	SDW
09-13-2023	11:08	23-01624	2	Sr-90	8537	A4	SDW
09-13-2023	11:08	23-01624	3	Sr-90	8537	B1	SDW
09-13-2023	11:08	23-01624	4	Sr-90	8537	B2	SDW
09-13-2023	11:08	23-01624	5	Sr-90	8537	B3	SDW
09-13-2023	11:08	23-01624	6	Sr-90	8537	B4	SDW
09-14-2023	7:11	Daily	QA	bkg	8538- 8541	all	SDW
09-14-2023	9:27	Daily	QA	eff	8542- 8549	all	SDW
09-14-2023	10:39	23-01636	1	Sr-90	8550	B1	SDW



ARS Aleut Analytical, LLC Analytical Reports

for

GES-AIS, LLC

Sr-90 - Standards & Carrier

Revision Date: 12.20.2022

GPC D 1155921 Batch Report

Batch Name: S-0370 Verification				Calibration: Fitted Efficiency				
Procedure: Sr-90, Sr-89/90				Preset Count Time (min): 120				
Batch ID: 6111				Count Mode: Simultaneous				
Sample ID	Detector ID	Gross Alpha Counts (cpm)	Gross Beta Counts (cpm)	Alpha activity (uCi)	Beta activity (uCi)	Count Time (s)	Voltage (V)	Run Date & Time
S-0370-V1	C4	71	2260	-0.47406626943265	89.4422228238273	7200	1290	1/12/2023 12:26:46 PM
S-0370-V2	D1	65	2170	-0.92098952608744	84.4415770675348	7200	1290	1/12/2023 12:26:46 PM
S-0370-V3	D2	85	2511.5	-0.62087739064570	97.1395950724782	7200	1290	1/12/2023 12:26:46 PM
S-0370-V4	D3	79	2332.5	-0.99864904833991	95.7133963061854	7200	1290	1/12/2023 12:26:46 PM
S-0370-V5	D4	61	2359.5	-1.34532316853981	96.8047137352219	7200	1290	1/12/2023 12:26:46 PM

Assignment Summary

Drawer	Batch ID	Detector	Batch	Sample	Procedure	Standard	Count Time	Run Date & Time
LB 4200 C	6111	C4	S-0370 Verification	S-0370-V1	Sr-90, Sr-89/90		7200	1/12/2023 12:26:37 PM
LB 4200 D	6111	D1	S-0370 Verification	S-0370-V2	Sr-90, Sr-89/90		7200	1/12/2023 12:26:37 PM
LB 4200 D	6111	D2	S-0370 Verification	S-0370-V3	Sr-90, Sr-89/90		7200	1/12/2023 12:26:37 PM
LB 4200 D	6111	D3	S-0370 Verification	S-0370-V4	Sr-90, Sr-89/90		7200	1/12/2023 12:26:37 PM
LB 4200 D	6111	D4	S-0370 Verification	S-0370-V5	Sr-90, Sr-89/90		7200	1/12/2023 12:26:37 PM

Weight Spreadsheet for Two Standards Verification

S-0370 Verification Weights	
Tech:	KE
Pipette:	TU30597
Scale ID:	TO350192
Standard 1 ID:	S-0370
Standard 2 ID:	N/A
Sample ID	Std. Weight(g)
S-0370-V1	1.009
S-0370-V2	1.002
S-0370-V3	1.002
S-0370-V4	1.001
S-0370-V5	1.002
N/A-V1	
N/A-V2	
N/A-V3	
N/A-V4	
N/A-V5	

DetectorID	AnalysisDate	BKG_CountMins	BKG_Count_ALPHA	BKG_Count_BETA
A1	01/06/2023	900	42.00	609.00
A2	01/06/2023	900	35.00	674.00
A3	01/06/2023	900	34.00	622.00
A4	01/06/2023	900	39.00	666.00
B1	01/06/2023	900	48.00	1058.00
B2	01/06/2023	900	54.00	715.00
B3	01/06/2023	900	47.00	682.00
B4	01/06/2023	900	43.00	722.00
C1	01/06/2023	900	42.00	624.00
C2	01/06/2023	900	44.00	688.00
C3	01/06/2023	900	40.00	672.00
C4	01/06/2023	900	35.00	718.00
D1	01/06/2023	900	38.00	659.00
D2	01/06/2023	900	41.00	784.00
D3	01/06/2023	900	25.00	719.00
D4	01/06/2023	900	37.00	712.00

$$/900 = 0.80$$

$$/900 = 0.73$$

$$/900 = 0.80$$

PALA-RAD-032-FM-04 r00.0 Sr-90 Carrier Verification

Tech:	LC
Date:	5/5/2023
Pipette:	TU30597
Reagent ID:	R23-00294

Acceptable Range	
Low (mg)	High (mg)
11.495	12.705

Sample ID	Empty Weight (g)	Filled Weight (g)	Yield (mg)
R23-00294-01	7.7125	7.7242	11.7
R23-00294-02	7.7289	7.7404	11.5
R23-00294-03	7.7234	7.7356	12.2
R23-00294-04	7.702	7.7136	11.6
R23-00294-05	7.7926	7.8047	12.1

CERTIFICATE OF CALIBRATION**CUSTOM BETA PLANCHET STANDARDS**Radionuclide: Sr-90⁽¹⁾**COPY**Half Life⁽²⁾: 28.5 ± 0.2 years Reference Date: 1200 PST September 1, 1999

Serial Number	Activity	Mass	Total Uncertainty (99% Confidence Level)
J589	351.7 Bq (9.505 nCi)	0.0001 grams	1.81%
J590	392.9 Bq (10.62 nCi)	0.0199 grams	1.79%
J591	370.7 Bq (10.02 nCi)	0.0390 grams	1.80%
J592	358.0 Bq (9.677 nCi)	0.0614 grams	1.81%
J593	398.1 Bq (10.76 nCi)	0.0782 grams	1.79%
J594	385.5 Bq (10.42 nCi)	0.1036 grams	1.80%
J595	374.1 Bq (10.11 nCi)	0.2690 grams	1.80%

PRINCIPAL EMISSIONS⁽²⁾

Type	Energy (keV)	Intensity (%)
beta (Sr-90)	E _{max} = 546 E _{avg} = 196	100
beta (Y-90)	E _{max} = 2282 E _{avg} = 934	100

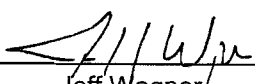
SOURCE DESCRIPTION

Active Diameter:	49.7 mm	Backing:	Stainless steel
Overall Diameter:	50.8 mm	Cover:	none
Thickness:	3 mm		

METHOD OF CALIBRATION

The source was calibrated by dispensing a gravimetric aliquot of a solution calibrated by liquid scintillation using an efficiency established through ongoing intercomparisons with the National Institute of Standards and Technology. Gravimetric aliquots of this master solution were uniformly mixed in epoxy and transferred to the planchets. This standard is indirectly (implicitly) traceable to the National Institute of Standards and Technology.

North American Scientific, Inc. actively participates in the Radioactivity Measurements Assurance Program conducted by the National Institute of Standards and Technology in cooperation with the Nuclear Energy Institute.


 Jeff Wagner
 Calibration Laboratory

December 27, 1999

Date

REFERENCES

- (1) Y-90 daughter in equilibrium. Activity value is for Sr-90 only.
 (2) Table of Radioactive Isotopes, 7th edition, 1986.

• LEAK TEST CERTIFICATION ON REVERSE •

CERTIFICATE OF CALIBRATION**CUSTOM ALPHA PLANCHET STANDARDS****COPY**Radionuclide: Th-230⁽¹⁾Half Life⁽²⁾: $(7.54 \pm 0.03) \times 10^4$ years Reference Date: 1200 PST September 1, 1999

Serial Number	Activity	Mass	Total Uncertainty (99% Confidence Level)
J596	379.3 Bq (10.25 nCi)	0.0002 grams	3.18%
J597	374.1 Bq (10.11 nCi)	0.0217 grams	3.18%
J598	367.1 Bq (9.921 nCi)	0.0435 grams	3.18%
J599	362.8 Bq (9.805 nCi)	0.0629 grams	3.18%
J600	354.2 Bq (9.573 nCi)	0.0791 grams	3.19%
J601	361.4 Bq (9.767 nCi)	0.1003 grams	3.19%
J602	359.2 Bq (9.709 nCi)	0.2448 grams	3.19%

PRINCIPAL EMISSIONS⁽²⁾

Type	Energy (keV)	Intensity (%)
alpha	4621.1	23.4
alpha	4687.6	76.3


SOURCE DESCRIPTION

Active Diameter:	49.7 mm	Backing:	Stainless steel
Overall Diameter:	50.8 mm	Cover:	none
Thickness:	3 mm		

METHOD OF CALIBRATION

The source was calibrated by dispensing a gravimetric aliquot of a solution calibrated by liquid scintillation using an efficiency established through ongoing intercomparisons with the National Institute of Standards and Technology. Gravimetric aliquots of this master solution were uniformly mixed in epoxy and transferred to the planchets. This standard is indirectly (implicitly) traceable to the National Institute of Standards and Technology.

North American Scientific, Inc. actively participates in the Radioactivity Measurements Assurance Program conducted by the National Institute of Standards and Technology in cooperation with the Nuclear Energy Institute.



Jeff Wagner
Calibration Laboratory

December 23, 1999

Date

REFERENCES

- (1) The source contains 0.29% Ra-226 as of September 22, 1996.
 (2) Table of Radioactive Isotopes, 7th edition, 1986.

• LEAK TEST CERTIFICATION ON REVERSE •

North American Scientific, Inc. 7435 Greenbush Ave., North Hollywood, CA 91605 (818) 734-8600 Fax (818) 734-8606



ARS Aleut Analytical, LLC Analytical Reports

for

GES-AIS, LLC

Sr-90 - ICAL



Background Report

Batch Name: Batch_2843

Procedure: Background

Calibration: Background

Count Date: 2/18/2022 12:25:16 PM

Preset Count Time: 54000

Count Mode: Simultaneous

Calculated Background (cpm)		
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)
A1	4.4444E-002 +/- 7.0273E-003	6.5111E-001 +/- 2.6897E-002

Calculated Background (cpm)		
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)
A2	3.8889E-002 +/- 6.5734E-003	6.4111E-001 +/- 2.6690E-002

Calculated Background (cpm)		
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)
A3	3.7778E-002 +/- 6.4788E-003	6.7444E-001 +/- 2.7375E-002

Calculated Background (cpm)		
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)
A4	6.0000E-002 +/- 8.1650E-003	6.3000E-001 +/- 2.6458E-002

Batch Name: Batch_2844

Procedure: Background

Calibration: Background

Count Date: 2/18/2022 12:25:17 PM

Preset Count Time: 54000

Count Mode: Simultaneous

Calculated Background (cpm)		
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)
B1	6.4444E-002 +/- 8.4620E-003	8.9222E-001 +/- 3.1486E-002

Calculated Background (cpm)		
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)
B2	5.3333E-002 +/- 7.6980E-003	7.6333E-001 +/- 2.9123E-002

Calculated Background (cpm)		
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)
B3	5.5556E-002 +/- 7.8567E-003	7.7556E-001 +/- 2.9355E-002

Calculated Background (cpm)		
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)
B4	4.6667E-002 +/- 7.2008E-003	6.7556E-001 +/- 2.7397E-002

Batch Name: Batch_2845

Procedure: Background

Calibration: Background

Count Date: 2/18/2022 12:25:14 PM

Preset Count Time: 54000

Count Mode: Simultaneous

Calculated Background (cpm)		
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)
C1	3.2222E-002 +/- 5.9835E-003	6.4000E-001 +/- 2.6667E-002

Calculated Background (cpm)		
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)
C2	5.2222E-002 +/- 7.6174E-003	7.2444E-001 +/- 2.8371E-002

Calculated Background (cpm)		
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)
C3	5.8889E-002 +/- 8.0890E-003	6.2444E-001 +/- 2.6341E-002

Calculated Background (cpm)		
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)
C4	4.2222E-002 +/- 6.8493E-003	6.9667E-001 +/- 2.7822E-002

Batch Name: Batch_2846

Procedure: Background

Calibration: Background

Count Date: 2/18/2022 12:25:18 PM

Preset Count Time: 54000

Count Mode: Simultaneous

Calculated Background (cpm)		
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)
D1	6.1111E-002 +/- 8.2402E-003	6.7778E-001 +/- 2.7442E-002

Calculated Background (cpm)		
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)
D2	4.7778E-002 +/- 7.2860E-003	6.7222E-001 +/- 2.7330E-002

Calculated Background (cpm)		
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)
D3	3.0000E-002 +/- 5.7735E-003	6.2889E-001 +/- 2.6434E-002

Calculated Background (cpm)		
Detector Name	Alpha Bkg Rate (cpm)	Beta Bkg Rate (cpm)
D4	6.3333E-002 +/- 8.3887E-003	6.8222E-001 +/- 2.7532E-002



Fitted Efficiency Report

Batch Name: A1 beta attenuation curve

Count Date: 12/23/2021 9:02:50 AM

Procedure: Beta Fitted Efficiency

Preset Count Time: 300

Calibration: Fitted Efficiency

Count Mode: Simultaneous

Decay Mode: Beta

Batch ID 2265

Detector: A1

Drawer: LB 4200 A

Device: LB 4200 A

Efficiency Coefficients

C0 = 4.0408E+001 +/- 2.8752E-001

C1 = -2.8180E+001 +/- 2.2003E+000

Chi^2 = 1.4509E+001

Spillover Coefficients

Spill C0 = 1.9967E+000 +/- 7.3634E-002

Spill C1 = -1.0768E+000 +/- 5.9821E-001

Chi^2 = 2.0761E+000

Decay Corrected

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.1752E+003 +/- 9.1748E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	37.42	1.91
1	1.1494E+004 +/- 1.1494E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	41.96	2.03
1	1.0871E+004 +/- 1.0870E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	42.06	1.76
1	9.8039E+003 +/- 9.8039E+001	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	39.28	1.99
1	1.0526E+004 +/- 1.0526E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	37.92	1.87
1	9.8039E+003 +/- 9.8039E+001	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	36.48	2.29
1	8.5479E+003 +/- 8.5474E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	32.77	1.62

Efficiency Coefficients

C0 = 4.0711E+001 +/- 3.0232E-001

C1 = -7.9690E+001 +/- 6.3779E+000

Chi^2 = 1.4847E+001

Spillover Coefficients

Spill C0 = 2.0151E+000 +/- 7.8306E-002

Spill C1 = -5.2700E+001 +/- 3.5162E+001

Chi^2 = 2.1443E+000

Decay Corrected

Exponential fit 12-20-21

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.1752E+003 +/- 9.1748E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	37.42	1.91
1	1.1494E+004 +/- 1.1494E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	41.96	2.03
1	1.0871E+004 +/- 1.0870E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	42.06	1.76
1	9.8039E+003 +/- 9.8039E+001	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	39.28	1.99
1	1.0526E+004 +/- 1.0526E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	37.92	1.87
1	9.8039E+003 +/- 9.8039E+001	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	36.48	2.29
1	8.5479E+003 +/- 8.5474E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	32.77	1.62



Fitted Efficiency Report

Batch Name: A2 beta attenuation curve

Count Date: 12/23/2021 9:02:50 AM

Procedure: Beta Fitted Efficiency

Preset Count Time: 300

Calibration: Fitted Efficiency

Count Mode: Simultaneous

Decay Mode: Beta

Batch ID 2266

Detector: A2

Drawer: LB 4200 A

Device: LB 4200 A

Efficiency Coefficients

C0 = 4.1302E+001 +/- 2.9359E-001

C1 = -2.9318E+001 +/- 2.2434E+000

Chi^2 = 9.3177E+000

Spillover Coefficients

Spill C0 = 1.7462E+000 +/- 6.7266E-002

Spill C1 = -2.1954E+000 +/- 5.0885E-001

Chi^2 = 2.1387E+000

Decay Corrected

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.5238E+003 +/- 9.5238E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	38.84	1.76
1	1.1628E+004 +/- 1.1628E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	42.45	1.70
1	1.0989E+004 +/- 1.0989E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	42.52	1.39
1	9.9020E+003 +/- 9.9015E+001	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	39.67	1.61
1	1.0638E+004 +/- 1.0638E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	38.33	1.83
1	1.0204E+004 +/- 1.0204E+002	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	37.96	1.69
1	8.6957E+003 +/- 8.6957E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	33.34	1.10

Efficiency Coefficients

C0 = 4.1543E+001 +/- 3.0850E-001

C1 = -8.0432E+001 +/- 6.3781E+000

Chi^2 = 9.5705E+000

Spillover Coefficients

Spill C0 = 1.7808E+000 +/- 7.5646E-002

Spill C1 = -1.4689E+002 +/- 4.1134E+001

Chi^2 = 2.3348E+000

Decay Corrected

Exponential fit 12/23/21

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.5238E+003 +/- 9.5238E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	38.84	1.76
1	1.1628E+004 +/- 1.1628E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	42.45	1.70
1	1.0989E+004 +/- 1.0989E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	42.52	1.39
1	9.9020E+003 +/- 9.9015E+001	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	39.67	1.61
1	1.0638E+004 +/- 1.0638E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	38.33	1.83
1	1.0204E+004 +/- 1.0204E+002	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	37.96	1.69
1	8.6957E+003 +/- 8.6957E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	33.34	1.10



Fitted Efficiency Report

Batch Name: A3 beta attenuation curve

Count Date: 12/23/2021 9:02:51 AM

Procedure: Beta Fitted Efficiency

Preset Count Time: 300

Calibration: Fitted Efficiency

Count Mode: Simultaneous

Decay Mode: Beta

Batch ID 2267

Detector: A3

Drawer: LB 4200 A

Device: LB 4200 A

Efficiency Coefficients

C0 = 3.9578E+001 +/- 2.8246E-001

C1 = -2.4656E+001 +/- 2.1878E+000

Chi^2 = 9.1236E+000

Spillover Coefficients

Spill C0 = 1.6660E+000 +/- 6.7388E-002

Spill C1 = -1.1467E+000 +/- 5.4590E-001

Chi^2 = 2.3602E-001

Decay Corrected

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.0918E+003 +/- 9.0914E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	37.08	1.57
1	1.1111E+004 +/- 1.1111E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	40.56	1.69
1	1.0529E+004 +/- 1.0528E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	40.74	1.67
1	9.6163E+003 +/- 9.6159E+001	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	38.53	1.61
1	1.0309E+004 +/- 1.0309E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	37.14	1.63
1	9.9010E+003 +/- 9.9010E+001	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	36.84	1.50
1	8.5479E+003 +/- 8.5474E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	32.77	1.35

Efficiency Coefficients

C0 = 3.9775E+001 +/- 2.9536E-001

C1 = -6.9600E+001 +/- 6.3779E+000

Chi^2 = 9.3936E+000

Spillover Coefficients

Spill C0 = 1.6735E+000 +/- 7.0849E-002

Spill C1 = -7.6733E+001 +/- 3.8499E+001

Chi^2 = 2.4568E-001

Decay Corrected

Exponential fit 12-23-21

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.0918E+003 +/- 9.0914E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	37.08	1.57
1	1.1111E+004 +/- 1.1111E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	40.56	1.69
1	1.0529E+004 +/- 1.0528E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	40.74	1.67
1	9.6163E+003 +/- 9.6159E+001	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	38.53	1.61
1	1.0309E+004 +/- 1.0309E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	37.14	1.63
1	9.9010E+003 +/- 9.9010E+001	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	36.84	1.50
1	8.5479E+003 +/- 8.5474E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	32.77	1.35



Fitted Efficiency Report

Batch Name: A4 beta attenuation curve

Count Date: 12/23/2021 9:02:52 AM

Procedure: Beta Fitted Efficiency

Preset Count Time: 300

Calibration: Fitted Efficiency

Count Mode: Simultaneous

Decay Mode: Beta

Batch ID 2268

Detector: A4

Drawer: LB 4200 A

Device: LB 4200 A

Efficiency Coefficients

C0 = 3.9352E+001 +/- 2.8129E-001

C1 = -2.5774E+001 +/- 2.1743E+000

Chi^2 = 1.3680E+001

Spillover Coefficients

Spill C0 = 1.8883E+000 +/- 7.2706E-002

Spill C1 = -6.6096E-001 +/- 6.0756E-001

Chi^2 = 3.6241E-001

Decay Corrected

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.0090E+003 +/- 9.0090E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	36.74	1.95
1	1.1364E+004 +/- 1.1364E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	41.48	1.86
1	1.0527E+004 +/- 1.0527E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	40.73	1.84
1	9.4340E+003 +/- 9.4340E+001	J592	61.4 mg	2.4961E+004	9/1/1999 3:00:31 PM	37.80	1.72
1	1.0204E+004 +/- 1.0204E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	36.76	1.86
1	9.6173E+003 +/- 9.6163E+001	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	35.78	1.93
1	8.4746E+003 +/- 8.4746E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	32.49	1.70

Efficiency Coefficients

C0 = 3.9634E+001 +/- 2.9432E-001

C1 = -7.4702E+001 +/- 6.3781E+000

Chi^2 = 1.3822E+001

Spillover Coefficients

Spill C0 = 1.8939E+000 +/- 7.4441E-002

Spill C1 = -3.7082E+001 +/- 3.4671E+001

Chi^2 = 3.6392E-001

Decay Corrected

Exponential fit 12/23/21

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.0090E+003 +/- 9.0090E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	36.74	1.95
1	1.1364E+004 +/- 1.1364E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	41.48	1.86
1	1.0527E+004 +/- 1.0527E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	40.73	1.84
1	9.4340E+003 +/- 9.4340E+001	J592	61.4 mg	2.4961E+004	9/1/1999 3:00:31 PM	37.80	1.72
1	1.0204E+004 +/- 1.0204E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	36.76	1.86
1	9.6173E+003 +/- 9.6163E+001	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	35.78	1.93
1	8.4746E+003 +/- 8.4746E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	32.49	1.70



Plateau Report

Plateau: Plateau 1015

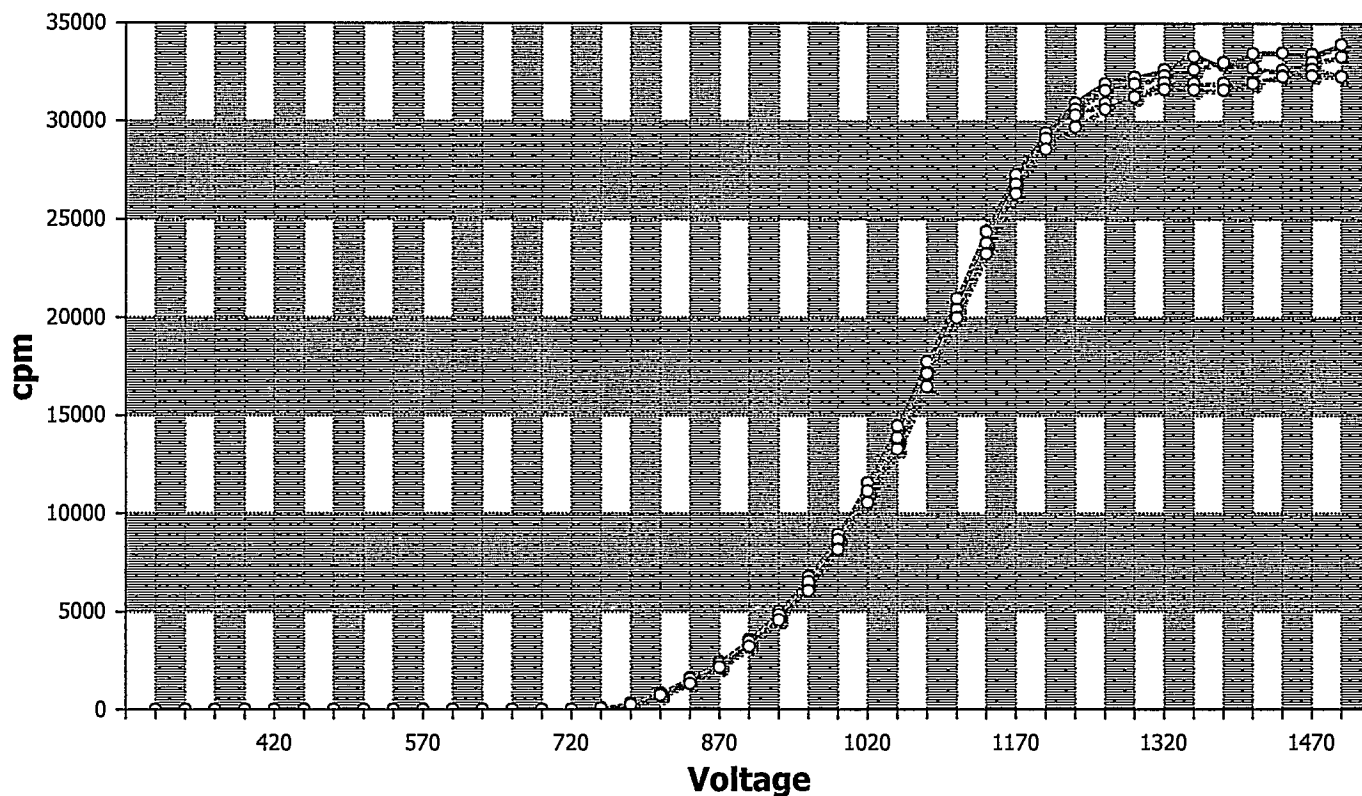
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Decay Mode: Beta

Drawer: LB 4200 A

Device: LB 4200 A

Operating Voltage: 1230



Iteration	A1		A2		A3		A4		Voltage
	cpm	Slope (%)	cpm	Slope (%)	cpm	Slope (%)	cpm	Slope (%)	
1	0		0		0		0		300
2	0		0.5		0		0		330
3	0	0	0.5	0	0	0	0	0	360
4	0	0	0.5	-100	0	0	0	0	390
5	0	0	0	0	0	0	0	0	420
6	0	0	0	0	0	0	0	0	450
7	0	0	0	0	0	0	0	0	480
8	0	0	0	0	0	0	0	0	510
9	0	0	0	0	0	0	0	0	540
10	0	0	0	0	0	0	0	0	570
11	0	0	0	0	0	0	0	0	600
12	0	0	0	0	0	0	0.5	100	630
13	0	0	0	0	0	0	0.5	1333	660
14	1.5	2822	1.5	4589	1.5	3789	0.5	1.017E+04	690
15	8	2271	14.5	1776	14.5	1670	10	1892	720
16	59.5	945.9	96	702.6	78	843.4	72	791.4	750
17	243.5	479.5	339	389.4	325	398.4	248.5	442.8	780
18	728	257.2	851	233.5	833	228.3	736	237.7	810
19	1425	180	1617	166.2	1579	163.6	1329	184.4	840
20	2278	142.7	2437	140.7	2304	142.9	2157	147.9	870

Iteration	A1		A2		A3		A4		Voltage
	cpm	Slope (%)	cpm	Slope (%)	cpm	Slope (%)	cpm	Slope (%)	
21	3316	124.3	3578	120.1	3464	119.2	3212	123.3	900
22	4658	111	5012	107.9	4830	108.8	4580	108.4	930
23	6415	101.1	6776	98.08	6508	98.34	6059	100.7	960
24	8481	90.01	8949	88.34	8668	87.38	8182	89.29	990
25	1.113E+04	67.23	1.158E+04	63.24	1.114E+04	66.37	1.056E+04	72.54	1020
26	1.375E+04	40.99	1.447E+04	35.77	1.387E+04	39.7	1.329E+04	45.35	1050
27	1.724E+04	19.99	1.775E+04	16.39	1.714E+04	19.65	1.648E+04	23.53	1080
28	2.055E+04	5.551	2.098E+04	2.364	2.041E+04	5.021	2E+04	7.62	1110
29	2.381E+04	0.005556	2.439E+04	0.001111	2.381E+04	0.001111	2.326E+04	0.005556	1140
30	2.703E+04	0.001111	2.727E+04	-0.001111	2.679E+04	-0.003333	2.632E+04	0.008889	1170
31	2.941E+04	0.01	2.941E+04	-0.001111	2.913E+04	-0.002222	2.857E+04	0.002222	1200
32	3.093E+04	0.005556	3.061E+04	0.01111	3.03E+04	0.005555	2.971E+04	0.01555	1230
33	3.192E+04	0.11	3.158E+04	0.1911	3.093E+04	0.1533	3.061E+04	0.1578	1260
34	3.226E+04	0.7633	3.192E+04	0.9287	3.126E+04	0.8532	3.126E+04	0.8664	1290
35	3.266E+04	2.357	3.235E+04	2.721	3.199E+04	2.609	3.165E+04	2.575	1320
36	3.332E+04	4.91	3.266E+04	5.62	3.195E+04	5.525	3.162E+04	5.25	1350
37	3.288E+04	8.349	3.302E+04	9.404	3.196E+04	8.857	3.162E+04	8.587	1380
38	3.348E+04	12.43	3.274E+04	13.69	3.205E+04	12.68	3.194E+04	12.62	1410
39	3.351E+04	18.27	3.263E+04	19.29	3.237E+04	18.18	3.23E+04	18.26	1440
40	3.344E+04		3.304E+04		3.267E+04		3.235E+04		1470
41	3.394E+04		3.331E+04		3.234E+04		3.23E+04		1500

Drawer A

Instrument: D 1155921

FFL 12/18/21

JK 12-31-21

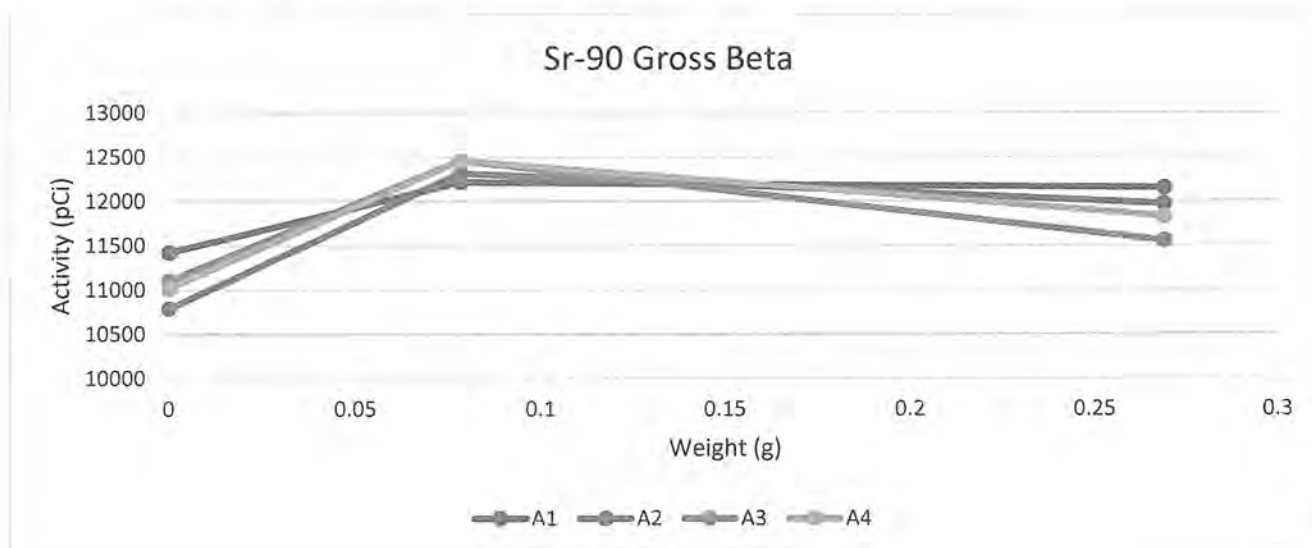
RSD 1-4-22

Sr 90

Source ID	Decay corrected activity (DPM)	Weight
J589	21102.00	0.0001
J593	23886.00	0.0782
J595	22446.00	0.269

Detector	Source ID	Weight	Act (pCi)	CSU 2s	Low	High	Pass/Fail
A1	J589	0.0001	11422.07657	2687.55665	8734.51992	14109.63322	9505.41
A2	J593	0.0782	12314.27276	2897.49926	9416.77350	15211.77202	10759.46
A3	J595	0.269	11551.26467	2718.10843	8833.15624	14269.37310	10110.81
A4	J589	0.0001	11017.07918	2592.21824	8424.86094	13609.29742	9505.41
A1	J593	0.0782	12216.19380	2874.39128	9341.80252	15090.58508	10759.46
A2	J595	0.269	11967.00046	2815.84257	9151.15789	14782.84303	10110.81
A3	J589	0.0001	11101.40642	2612.07633	8489.33009	13713.48275	9505.41
A4	J593	0.0782	12459.71539	2931.64630	9528.06909	15391.36169	10759.46
A1	J595	0.269	12147.08521	2858.47781	9288.60740	15005.56302	10110.81
A2	J589	0.0001	10788.70609	2538.54015	8250.16594	13327.24624	9505.41
A3	J593	0.0782	12459.71539	2931.64630	9528.06909	15391.36169	10759.46
A4	J595	0.269	11824.86018	2782.67284	9042.18734	14607.53302	10110.81

Activity (pCi)				
Weight (g)	A1	A2	A3	A4
0.0001	11422.08	10788.71	11101.41	11017.08
0.0782	12216.19	12314.27	12459.72	12459.72
0.269	12147.09	11967.00	11551.26	11824.86



GPC D 1155921 Batch Report

Batch Name: B21-01741 3

Calibration: Fitted Efficiency

Procedure: Attenuation Curve check

Preset Count Time (min): 3

Batch ID: 2295

Count Mode: Simultaneous

Sample ID	Detector ID	Gross Alpha Counts (cpm)	Gross Beta Counts (cpm)	Alpha activity (uCi)	Beta activity (uCi)	Count Time (s)	Voltage (V)	Run Date & Time
B21-01741-04	A1	98	5000	-29.5567561479378	23174.8098529675	180	1230	12/28/2021 7:34:22 AM
B21-01741-05	A2	81	5001	-94.8534781823619	25088.8436197349	180	1230	12/28/2021 7:34:22 AM
B21-01741-06	A4	0	4	-1.19508021653397	1.21630179051268	180	1230	12/28/2021 7:34:22 AM
B21-01741-07	A3	60	5000	-237.794438453306	20976.3977937965	180	1230	12/28/2021 7:34:22 AM
B21-01741-08	A1	0	14	-0.97552374264221	9.9739967932399	180	1230	12/28/2021 7:34:22 AM
B21-01741-09	A2	102	5001	134.455355892983	22274.1614316225	180	1230	12/28/2021 7:34:22 AM
B21-01741-10	A3	65	5000	-229.699571537084	25678.760411831	180	1230	12/28/2021 7:34:22 AM
B21-01741-11	A4	87	5000	-78.0314738352567	21389.0539297487	180	1230	12/28/2021 7:34:22 AM
B21-01741-12	A1	84	5000	-165.089585246865	21565.5278873617	180	1230	12/28/2021 7:34:22 AM
B21-01741-13	A2	0	3	-0.48591772632677	0.46876174445190	180	1230	12/28/2021 7:34:22 AM
B21-01741-14	A3	90	5000	68.5157991346159	22845.6014538385	180	1230	12/28/2021 7:34:22 AM
B21-01741-15	A4	77	5000	-218.63489315121	26306.1689410904	180	1230	12/28/2021 7:34:22 AM
B21-01741-16	A1	76	5003	-284.110358401531	25113.1952637614	180	1230	12/28/2021 7:34:22 AM
B21-01741-17	A2	52	5001	-366.203383917655	21162.222057301	180	1230	12/28/2021 7:34:22 AM
B21-01741-18	A3	1	7	1.14126030146588	3.56093693674032	180	1230	12/28/2021 7:34:22 AM
B21-01741-19	A4	85	5001	-103.434318444941	22542.1065346217	180	1230	12/28/2021 7:34:22 AM



Fitted Efficiency Report

Batch Name: B1 beta attenuation curve

Count Date: 12/23/2021 9:02:47 AM

Procedure: Beta Fitted Efficiency

Preset Count Time: 300

Calibration: Fitted Efficiency

Count Mode: Simultaneous

Decay Mode: Beta

Batch ID 2269

Detector: B1

Drawer: LB 4200 B

Device: LB 4200 B

Efficiency Coefficients

C0 = 3.9289E+001 +/- 2.7922E-001

C1 = -2.7825E+001 +/- 2.1324E+000

Chi^2 = 1.1838E+001

Spillover Coefficients

Spill C0 = 2.2162E+000 +/- 7.7361E-002

Spill C1 = -2.0110E+000 +/- 6.1344E-001

Chi^2 = 9.0092E-002

Decay Corrected

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.0090E+003 +/- 9.0090E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	36.74	2.20
1	1.1111E+004 +/- 1.1111E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	40.56	2.11
1	1.0526E+004 +/- 1.0526E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	40.73	2.17
1	9.4340E+003 +/- 9.4340E+001	J592	61.4 mg	2.4961E+004	9/1/1999 3:00:31 PM	37.80	2.10
1	1.0000E+004 +/- 1.0000E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	36.03	2.12
1	9.8049E+003 +/- 9.8044E+001	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	36.48	2.01
1	8.2653E+003 +/- 8.2649E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	31.69	1.66

Efficiency Coefficients

C0 = 3.9548E+001 +/- 2.9368E-001

C1 = -8.0504E+001 +/- 6.3780E+000

Chi^2 = 1.2155E+001

Spillover Coefficients

Spill C0 = 2.2261E+000 +/- 8.2568E-002

Spill C1 = -1.0342E+002 +/- 3.4386E+001

Chi^2 = 1.1273E-001

Decay Corrected

Exponential Fit 12-23-21

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.0090E+003 +/- 9.0090E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	36.74	2.20
1	1.1111E+004 +/- 1.1111E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	40.56	2.11
1	1.0526E+004 +/- 1.0526E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	40.73	2.17
1	9.4340E+003 +/- 9.4340E+001	J592	61.4 mg	2.4961E+004	9/1/1999 3:00:31 PM	37.80	2.10
1	1.0000E+004 +/- 1.0000E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	36.03	2.12
1	9.8049E+003 +/- 9.8044E+001	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	36.48	2.01
1	8.2653E+003 +/- 8.2649E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	31.69	1.66



Fitted Efficiency Report

Batch Name: B2 beta attenuation curve

Count Date: 12/23/2021 9:02:48 AM

Procedure: Beta Fitted Efficiency

Preset Count Time: 300

Calibration: Fitted Efficiency

Count Mode: Simultaneous

Decay Mode: Beta

Batch ID 2270

Detector: B2

Drawer: LB 4200 B

Device: LB 4200 B

Efficiency Coefficients

C0 = 3.9699E+001 +/- 2.8191E-001

C1 = -2.8167E+001 +/- 2.1509E+000

Chi^2 = 1.0309E+001

Spillover Coefficients

Spill C0 = 2.0745E+000 +/- 7.4528E-002

Spill C1 = -2.4534E+000 +/- 5.7911E-001

Chi^2 = 1.9145E+000

Decay Corrected

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.0909E+003 +/- 9.0909E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	37.07	2.33
1	1.1364E+004 +/- 1.1364E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	41.48	1.86
1	1.0417E+004 +/- 1.0417E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	40.30	1.86
1	9.4340E+003 +/- 9.4340E+001	J592	61.4 mg	2.4961E+004	9/1/1999 3:00:31 PM	37.80	2.20
1	1.0309E+004 +/- 1.0309E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	37.14	1.74
1	9.9010E+003 +/- 9.9010E+001	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	36.84	1.79
1	8.3342E+003 +/- 8.3337E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	31.95	1.44

Efficiency Coefficients

C0 = 3.9943E+001 +/- 2.9662E-001

C1 = -8.0529E+001 +/- 6.3780E+000

Chi^2 = 1.0662E+001

Spillover Coefficients

Spill C0 = 2.1293E+000 +/- 8.1361E-002

Spill C1 = -1.5191E+002 +/- 3.6305E+001

Chi^2 = 1.8916E+000

Decay Corrected

Exponential Fit 12/16/21

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.0909E+003 +/- 9.0909E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	37.07	2.33
1	1.1364E+004 +/- 1.1364E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	41.48	1.86
1	1.0417E+004 +/- 1.0417E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	40.30	1.86
1	9.4340E+003 +/- 9.4340E+001	J592	61.4 mg	2.4961E+004	9/1/1999 3:00:31 PM	37.80	2.20
1	1.0309E+004 +/- 1.0309E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	37.14	1.74
1	9.9010E+003 +/- 9.9010E+001	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	36.84	1.79
1	8.3342E+003 +/- 8.3337E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	31.95	1.44



Fitted Efficiency Report

Batch Name: B3 beta attenuation curve

Count Date: 12/23/2021 9:02:48 AM

Procedure: Beta Fitted Efficiency

Preset Count Time: 300

Calibration: Fitted Efficiency

Count Mode: Simultaneous

Decay Mode: Beta

Batch ID 2271

Detector: B3

Drawer: LB 4200 B

Device: LB 4200 B

Efficiency Coefficients

C0 = 3.9100E+001 +/- 2.7911E-001

C1 = -2.5210E+001 +/- 2.1560E+000

Chi^2 = 1.3852E+001

Spillover Coefficients

Spill C0 = 1.7960E+000 +/- 7.1725E-002

Spill C1 = -1.7845E-001 +/- 6.1407E-001

Chi^2 = 7.5698E-001

Decay Corrected

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	8.9286E+003 +/- 8.9286E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	36.41	1.87
1	1.1237E+004 +/- 1.1237E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	41.02	1.67
1	1.0526E+004 +/- 1.0526E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	40.73	1.98
1	9.2602E+003 +/- 9.2597E+001	J592	61.4 mg	2.4961E+004	9/1/1999 3:00:31 PM	37.10	1.80
1	1.0101E+004 +/- 1.0101E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	36.39	1.68
1	9.8039E+003 +/- 9.8039E+001	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	36.48	1.73
1	8.4042E+003 +/- 8.4038E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	32.22	1.78

Efficiency Coefficients

C0 = 3.9373E+001 +/- 2.9238E-001

C1 = -7.3262E+001 +/- 6.3779E+000

Chi^2 = 1.4130E+001

Spillover Coefficients

Spill C0 = 1.8084E+000 +/- 7.1932E-002

Spill C1 = -1.2746E+001 +/- 3.4311E+001

Chi^2 = 7.6303E-001

Decay Corrected

Exponential fit 12787

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	8.9286E+003 +/- 8.9286E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	36.41	1.87
1	1.1237E+004 +/- 1.1237E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	41.02	1.67
1	1.0526E+004 +/- 1.0526E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	40.73	1.98
1	9.2602E+003 +/- 9.2597E+001	J592	61.4 mg	2.4961E+004	9/1/1999 3:00:31 PM	37.10	1.80
1	1.0101E+004 +/- 1.0101E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	36.39	1.68
1	9.8039E+003 +/- 9.8039E+001	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	36.48	1.73
1	8.4042E+003 +/- 8.4038E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	32.22	1.78



Fitted Efficiency Report

Batch Name: B4 beta attenuation curve

Count Date: 12/23/2021 9:06:45 AM

Procedure: Beta Fitted Efficiency

Preset Count Time: 300

Calibration: Fitted Efficiency

Count Mode: Simultaneous

Decay Mode: Beta

Batch ID 2272

Detector: B4

Drawer: LB 4200 B

Device: LB 4200 B

Efficiency Coefficients

C0 = 3.9546E+001 +/- 2.8131E-001

C1 = -2.8251E+001 +/- 2.1508E+000

Chi^2 = 8.4750E+000

Spillover Coefficients

Spill C0 = 2.0217E+000 +/- 7.3596E-002

Spill C1 = -1.8304E+000 +/- 5.8126E-001

Chi^2 = 6.3875E-001

Decay Corrected

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.1743E+003 +/- 9.1743E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	37.41	1.98
1	1.1111E+004 +/- 1.1111E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	40.56	1.92
1	1.0526E+004 +/- 1.0526E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	40.73	1.90
1	9.4340E+003 +/- 9.4340E+001	J592	61.4 mg	2.4961E+004	9/1/1999 3:00:31 PM	37.80	2.08
1	1.0205E+004 +/- 1.0205E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	36.77	1.80
1	9.7087E+003 +/- 9.7087E+001	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	36.12	1.97
1	8.3333E+003 +/- 8.3333E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	31.95	1.49

Efficiency Coefficients

C0 = 3.9772E+001 +/- 2.9535E-001

C1 = -8.0985E+001 +/- 6.3781E+000

Chi^2 = 8.6400E+000

Spillover Coefficients

Spill C0 = 2.0344E+000 +/- 7.9201E-002

Spill C1 = -1.0113E+002 +/- 3.6213E+001

Chi^2 = 6.8958E-001

Decay Corrected

Exponential FPC 12-28-23

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.1743E+003 +/- 9.1743E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	37.41	1.98
1	1.1111E+004 +/- 1.1111E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	40.56	1.92
1	1.0526E+004 +/- 1.0526E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	40.73	1.90
1	9.4340E+003 +/- 9.4340E+001	J592	61.4 mg	2.4961E+004	9/1/1999 3:00:31 PM	37.80	2.08
1	1.0205E+004 +/- 1.0205E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	36.77	1.80
1	9.7087E+003 +/- 9.7087E+001	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	36.12	1.97
1	8.3333E+003 +/- 8.3333E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	31.95	1.49



Plateau Report

Plateau: Plateau 1009

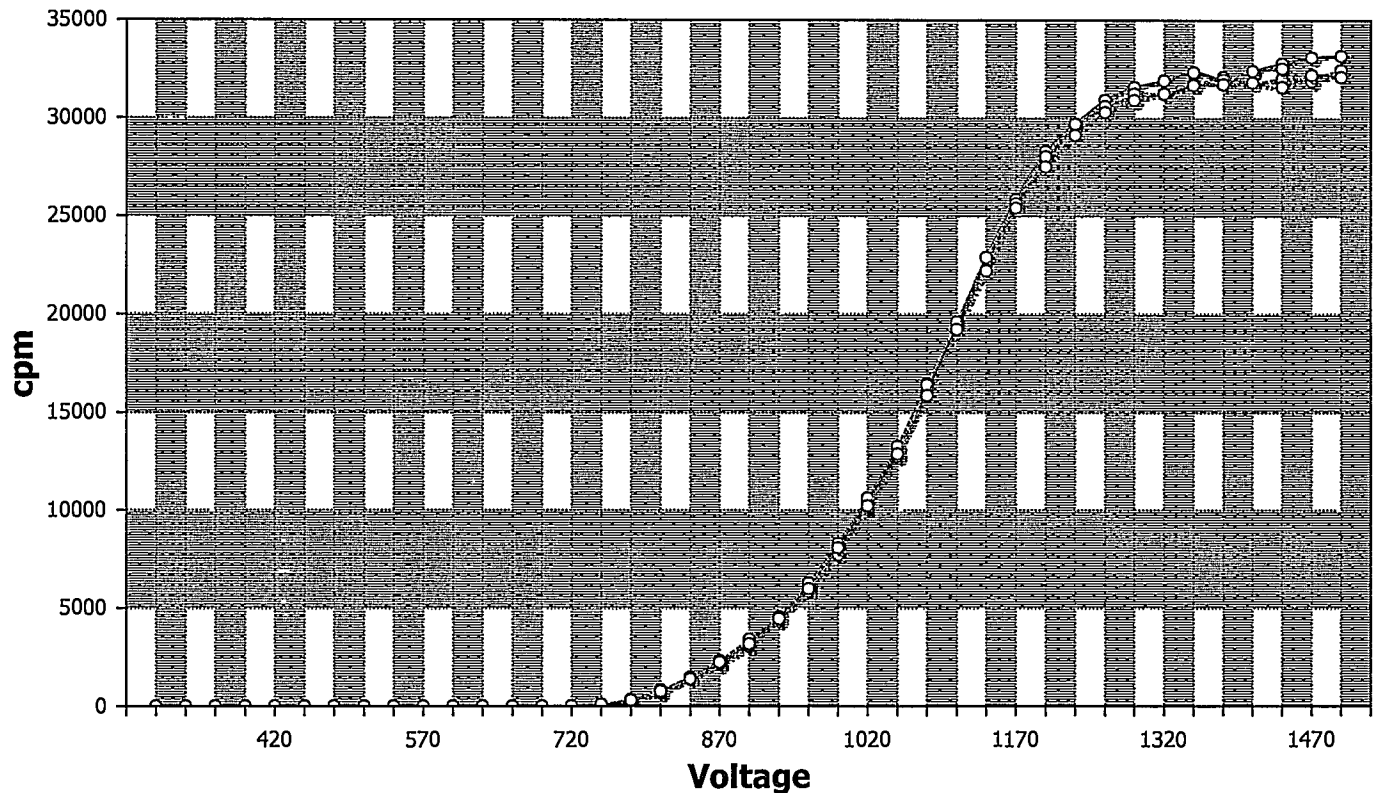
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Decay Mode: Beta

Drawer: LB 4200 B

Device: LB 4200 B

Operating Voltage: 1230



Iteration	B1		B2		B3		B4		Voltage
	cpm	Slope (%)	cpm	Slope (%)	cpm	Slope (%)	cpm	Slope (%)	
1	0		0		0		0		300
2	0		0		0		0		330
3	0	0	0	0	0	0	0	0	360
4	0	0	0	0	0	0	0	0	390
5	0	0	0	0	0	0	0	0	420
6	0.5	0	0	0	0	0	0	0	450
7	0	0	0	0	0	0	0	0	480
8	0	0	0	0	0	0	0	0	510
9	0	0	0	0	0	0	0	0	540
10	0	0	0	0	0	0	0	0	570
11	0	0	0	0	0	0	0	0	600
12	0	0	0	0	0.5	400	0	0	630
13	0.5	2667	0.5	2867	0	0	0.5	3367	660
14	0	0	2	3917	3	1767	1.5	5222	690
15	20	1172	20.5	1321	11	1877	24.5	1008	720
16	87	691	107.5	618.8	74.5	728.9	105.5	578.7	750
17	308.5	383.5	354	343.7	274	407	319	357.1	780
18	757.5	238.3	833	222.6	686	253.4	770	232.6	810
19	1460	165.4	1483	171.1	1378	168.4	1401	171.5	840
20	2219	139.5	2325	134.6	2130	140.9	2251	135.8	870

Iteration	B1		B2		B3		B4		Voltage
	cpm	Slope (%)	cpm	Slope (%)	cpm	Slope (%)	cpm	Slope (%)	
21	3198	119.5	3414	115.8	3034	122.6	3183	119.3	900
22	4532	106.4	4562	108.6	4361	106.8	4463	108	930
23	6037	99.74	6292	96.54	5840	99.87	5993	98.46	960
24	8033	88.61	8316	87.42	7716	91.01	8075	87.07	990
25	1.048E+04	72.79	1.065E+04	70.09	1.011E+04	77.08	1.023E+04	74.41	1020
26	1.299E+04	47.37	1.329E+04	44.45	1.276E+04	50.84	1.289E+04	48.15	1050
27	1.604E+04	24.57	1.648E+04	23.15	1.639E+04	26.73	1.587E+04	25.9	1080
28	1.948E+04	8.945	1.961E+04	7.612	1.961E+04	9.951	1.923E+04	9.374	1110
29	2.29E+04	-0.001111	2.29E+04	0.001111	2.29E+04	0	2.222E+04	0.004444	1140
30	2.586E+04	0.001111	2.564E+04	-0.001111	2.564E+04	0	2.543E+04	0.006666	1170
31	2.83E+04	0	2.804E+04	-0.003333	2.804E+04	0.006667	2.752E+04	0.002222	1200
32	2.97E+04	0.004444	2.97E+04	0.002222	2.97E+04	0.003333	2.913E+04	-0.005555	1230
33	3.093E+04	0.02666	3.061E+04	0.04222	3.062E+04	0.08221	3.03E+04	0.01556	1260
34	3.158E+04	0.2	3.125E+04	0.2555	3.125E+04	0.4489	3.093E+04	0.2589	1290
35	3.193E+04	1.046	3.127E+04	1.215	3.129E+04	1.695	3.126E+04	1.177	1320
36	3.235E+04	2.937	3.169E+04	3.185	3.177E+04	3.895	3.17E+04	3.135	1350
37	3.203E+04	5.811	3.21E+04	6.276	3.195E+04	6.827	3.174E+04	6.029	1380
38	3.242E+04	9.054	3.184E+04	9.658	3.242E+04	10.38	3.182E+04	9.134	1410
39	3.281E+04	12.99	3.202E+04	14.02	3.255E+04	14.39	3.16E+04	13.13	1440
40	3.312E+04		3.21E+04		3.191E+04		3.222E+04		1470
41	3.32E+04		3.247E+04		3.246E+04		3.213E+04		1500

Instrument: D 1155921

FTL 1278-4

1-4-22

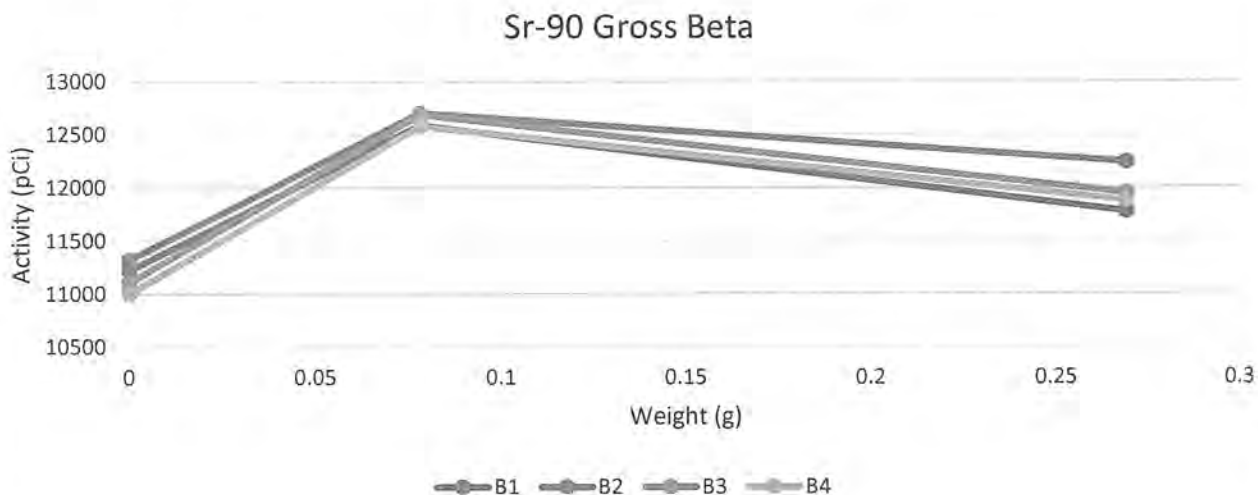
RDW 1-4-22

Sr 90

Source ID	Decay corrected activity (DPM)	Weight
J589	21102.00	0.0001
J593	23886.00	0.0782
J595	22446.00	0.269

Detector	Source ID	Weight	Act (pCi)	CSU 2s	Low	High	Pass/Fail
B1	J589	0.0001	11218.94124	2639.74131	8579.19993	13858.68255	9505.41
B2	J593	0.0782	12699.68570	2988.27647	9711.40923	15687.96217	10759.46
B3	J595	0.269	11946.11482	2811.08880	9135.02602	14757.20362	10110.81
B4	J589	0.0001	11000.52235	2588.39179	8412.13056	13588.91414	9505.41
B1	J593	0.0782	12586.78423	2961.66022	9625.12401	15548.44445	10759.46
B2	J595	0.269	12238.26123	2879.93721	9358.32402	15118.19844	10110.81
B3	J589	0.0001	11105.61304	2613.08076	8492.53228	13718.69380	9505.41
B4	J593	0.0782	12576.09655	2959.15434	9616.94221	15535.25089	10759.46
B1	J595	0.269	11772.50512	2770.21530	9002.28982	14542.72042	10110.81
B2	J589	0.0001	11320.98268	2663.74388	8657.23880	13984.72656	9505.41
B3	J593	0.0782	12687.08644	2985.34981	9701.73663	15672.43625	10759.46
B4	J595	0.269	11878.23704	2794.99513	9083.24191	14673.23217	10110.81

Weight (g)	Activity (pCi)			
	B1	B2	B3	B4
0.0001	11218.94	11320.98	11105.61	11000.52
0.0782	12586.78	12699.69	12687.09	12576.10
0.269	11772.51	12238.26	11946.11	11878.24



GPC D 1155921 Batch Report

Batch Name: B21-01745 2

Calibration: Fitted Efficiency

Procedure: Attenuation Curve check

Preset Count Time (min): 3

Batch ID: 2297

Count Mode: Simultaneous

Sample ID	Detector ID	Gross Alpha Counts (cpm)	Gross Beta Counts (cpm)	Alpha activity (uCi)	Beta activity (uCi)	Count Time (s)	Voltage (V)	Run Date & Time
* B21-01745-04	A1	0	10	-0.82502949262840	6.68017813280358	180	1230	12/28/2021 8:32:59 AM
* B21-01745-05	A2	0	4	-0.51931768160980	1.27522948249643	180	1230	12/28/2021 8:32:59 AM
* B21-01745-06	A3	1	2	1.30891296527968	-0.64867137086115	180	1230	12/28/2021 8:32:59 AM
* B21-01745-07	A4	1	7	0.66051331830339	3.51359327640178	180	1230	12/28/2021 8:32:59 AM
B21-01745-08	B1	1	7	0.30474149660644	3.71669627820273	180	1230	12/28/2021 8:32:59 AM
B21-01745-09	B2	90	5001	-176.967015809591	23205.5810314945	180	1230	12/28/2021 8:32:59 AM
B21-01745-10	B3	107	5000	196.566949194018	25889.8948317281	180	1230	12/28/2021 8:32:59 AM
B21-01745-11	B4	56	5000	-445.070190582535	21004.0031970738	180	1230	12/28/2021 8:32:59 AM
B21-01745-12	B1	69	5000	-403.815636103744	20772.8395457981	180	1230	12/28/2021 8:32:59 AM
B21-01745-13	B2	1	4	1.09239979971143	1.39778969860025	180	1230	12/28/2021 8:32:59 AM
B21-01745-14	B3	96	5000	57.4911998329694	22667.6250350177	180	1230	12/28/2021 8:32:59 AM
B21-01745-15	B4	92	5000	-116.485838171923	25667.6929558305	180	1230	12/28/2021 8:32:59 AM
B21-01745-16	B1	93	5001	-214.054845874465	25314.699853023	180	1230	12/28/2021 8:32:59 AM
B21-01745-17	B2	87	5001	-194.675089409105	21608.7663786575	180	1230	12/28/2021 8:32:59 AM
B21-01745-18	B3	1	8	1.08765596577466	4.3855491011429	180	1230	12/28/2021 8:32:59 AM
B21-01745-19	B4	107	5000	55.1215857255281	22847.9151353455	180	1230	12/28/2021 8:32:59 AM

* Samples removed

Dec 12 28 21



Fitted Efficiency Report

Batch Name: C1 beta attenuation curve

Count Date: 12/23/2021 9:09:54 AM

Procedure: Beta Fitted Efficiency

Preset Count Time: 300

Calibration: Fitted Efficiency

Count Mode: Simultaneous

Decay Mode: Beta

Batch ID 2273

Detector: C1

Drawer: LB 4200 C

Device: LB 4200 C

Efficiency Coefficients

C0 = 4.2822E+001 +/- 3.0593E-001

C1 = -2.9046E+001 +/- 2.3576E+000

Chi^2 = 1.4842E+001

Spillover Coefficients

Spill C0 = 1.7963E+000 +/- 7.0852E-002

Spill C1 = -9.5086E-001 +/- 5.8683E-001

Chi^2 = 1.5199E+000

Decay Corrected

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.8039E+003 +/- 9.8039E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	39.98	1.90
1	1.2346E+004 +/- 1.2346E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	45.07	1.73
1	1.1497E+004 +/- 1.1495E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	44.48	1.78
1	1.0309E+004 +/- 1.0309E+002	J592	61.4 mg	2.4961E+004	9/1/1999 3:00:31 PM	41.30	1.91
1	1.1111E+004 +/- 1.1111E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	40.03	1.45
1	1.0309E+004 +/- 1.0309E+002	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	38.36	1.77
1	9.1743E+003 +/- 9.1743E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	35.17	1.57

Efficiency Coefficients

C0 = 4.3153E+001 +/- 3.2045E-001

C1 = -7.7693E+001 +/- 6.3781E+000

Chi^2 = 1.4967E+001

Spillover Coefficients

Spill C0 = 1.8191E+000 +/- 7.3150E-002

Spill C1 = -5.9535E+001 +/- 3.5861E+001

Chi^2 = 1.5301E+000

Decay Corrected

Exponential fit 12/20/21

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.8039E+003 +/- 9.8039E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	39.98	1.90
1	1.2346E+004 +/- 1.2346E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	45.07	1.73
1	1.1497E+004 +/- 1.1495E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	44.48	1.78
1	1.0309E+004 +/- 1.0309E+002	J592	61.4 mg	2.4961E+004	9/1/1999 3:00:31 PM	41.30	1.91
1	1.1111E+004 +/- 1.1111E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	40.03	1.45
1	1.0309E+004 +/- 1.0309E+002	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	38.36	1.77
1	9.1743E+003 +/- 9.1743E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	35.17	1.57



Fitted Efficiency Report

Batch Name: C2 beta attenuation curve

Count Date: 12/23/2021 9:13:39 AM

Procedure: Beta Fitted Efficiency

Preset Count Time: 300

Calibration: Fitted Efficiency

Count Mode: Simultaneous

Decay Mode: Beta

Batch ID 2274

Detector: C2

Drawer: LB 4200 C

Device: LB 4200 C

Efficiency Coefficients

C0 = 4.3756E+001 +/- 3.1086E-001

C1 = -3.1643E+001 +/- 2.3692E+000

Chi^2 = 1.2153E+001

Spillover Coefficients

Spill C0 = 2.0410E+000 +/- 7.5337E-002

Spill C1 = -9.5215E-001 +/- 6.2310E-001

Chi^2 = 5.1393E-001

Decay Corrected

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	1.0000E+004 +/- 1.0000E+002	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	40.78	2.18
1	1.2500E+004 +/- 1.2500E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	45.63	1.92
1	1.1628E+004 +/- 1.1628E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	44.99	1.91
1	1.0526E+004 +/- 1.0526E+002	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	42.17	1.93
1	1.1236E+004 +/- 1.1236E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	40.48	2.03
1	1.0754E+004 +/- 1.0753E+002	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	40.01	2.03
1	9.1743E+003 +/- 9.1743E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	35.17	1.77

Efficiency Coefficients

C0 = 4.4063E+001 +/- 3.2721E-001

C1 = -8.2651E+001 +/- 6.3781E+000

Chi^2 = 1.2455E+001

Spillover Coefficients

Spill C0 = 2.0518E+000 +/- 7.7884E-002

Spill C1 = -5.1634E+001 +/- 3.3820E+001

Chi^2 = 5.1825E-001

Decay Corrected

Exponential fit 12/23/21

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	1.0000E+004 +/- 1.0000E+002	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	40.78	2.18
1	1.2500E+004 +/- 1.2500E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	45.63	1.92
1	1.1628E+004 +/- 1.1628E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	44.99	1.91
1	1.0526E+004 +/- 1.0526E+002	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	42.17	1.93
1	1.1236E+004 +/- 1.1236E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	40.48	2.03
1	1.0754E+004 +/- 1.0753E+002	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	40.01	2.03
1	9.1743E+003 +/- 9.1743E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	35.17	1.77



Fitted Efficiency Report

Batch Name: C3 beta attenuation curve

Count Date: 12/23/2021 9:16:50 AM

Procedure: Beta Fitted Efficiency

Preset Count Time: 300

Calibration: Fitted Efficiency

Count Mode: Simultaneous

Decay Mode: Beta

Batch ID 2275

Detector: C3

Drawer: LB 4200 C

Device: LB 4200 C

Efficiency Coefficients

C0 = 4.1205E+001 +/- 2.9279E-001

C1 = -2.8369E+001 +/- 2.2392E+000

Chi^2 = 1.3336E+001

Spillover Coefficients

Spill C0 = 1.7263E+000 +/- 6.7559E-002

Spill C1 = -2.0103E+000 +/- 5.2211E-001

Chi^2 = 2.5743E-001

Decay Corrected

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.3458E+003 +/- 9.3458E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	38.11	1.62
1	1.1766E+004 +/- 1.1765E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	42.95	1.75
1	1.0991E+004 +/- 1.0990E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	42.53	1.72
1	9.9010E+003 +/- 9.9010E+001	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	39.67	1.60
1	1.0638E+004 +/- 1.0638E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	38.33	1.59
1	1.0309E+004 +/- 1.0309E+002	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	38.36	1.49
1	8.6965E+003 +/- 8.6961E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	33.34	1.18

Efficiency Coefficients

C0 = 4.1490E+001 +/- 3.0810E-001

C1 = -7.8264E+001 +/- 6.3779E+000

Chi^2 = 1.3776E+001

Spillover Coefficients

Spill C0 = 1.7440E+000 +/- 7.3738E-002

Spill C1 = -1.4045E+002 +/- 4.0256E+001

Chi^2 = 2.9001E-001

Decay Corrected

Exponential Fit 12/23/21

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.3458E+003 +/- 9.3458E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	38.11	1.62
1	1.1766E+004 +/- 1.1765E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	42.95	1.75
1	1.0991E+004 +/- 1.0990E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	42.53	1.72
1	9.9010E+003 +/- 9.9010E+001	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	39.67	1.60
1	1.0638E+004 +/- 1.0638E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	38.33	1.59
1	1.0309E+004 +/- 1.0309E+002	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	38.36	1.49
1	8.6965E+003 +/- 8.6961E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	33.34	1.18



Fitted Efficiency Report

Batch Name: C4 beta attenuation curve

Count Date: 12/23/2021 9:27:06 AM

Procedure: Beta Fitted Efficiency

Preset Count Time: 300

Calibration: Fitted Efficiency

Count Mode: Simultaneous

Decay Mode: Beta

Batch ID 2276

Detector: C4

Drawer: LB 4200 C

Device: LB 4200 C

Efficiency Coefficients

C0 = 4.1849E+001 +/- 2.9691E-001

C1 = -3.1583E+001 +/- 2.2524E+000

Chi^2 = 1.0965E+001

Spillover Coefficients

Spill C0 = 1.7807E+000 +/- 6.9009E-002

Spill C1 = -1.4719E+000 +/- 5.4759E-001

Chi^2 = 8.6755E-001

Decay Corrected

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.6154E+003 +/- 9.6154E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	39.21	1.78
1	1.1905E+004 +/- 1.1905E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	43.46	1.68
1	1.1113E+004 +/- 1.1112E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	43.00	1.60
1	1.0000E+004 +/- 1.0000E+002	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	40.06	1.76
1	1.0753E+004 +/- 1.0753E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	38.74	1.67
1	1.0206E+004 +/- 1.0205E+002	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	37.97	1.85
1	8.6965E+003 +/- 8.6961E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	33.34	1.33

Efficiency Coefficients

C0 = 4.2140E+001 +/- 3.1293E-001

C1 = -8.6488E+001 +/- 6.3779E+000

Chi^2 = 1.1211E+001

Spillover Coefficients

Spill C0 = 1.7911E+000 +/- 7.4196E-002

Spill C1 = -8.8725E+001 +/- 3.8325E+001

Chi^2 = 9.2281E-001

Decay Corrected

Exponential fit 12/23/21

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.6154E+003 +/- 9.6154E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	39.21	1.78
1	1.1905E+004 +/- 1.1905E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	43.46	1.68
1	1.1113E+004 +/- 1.1112E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	43.00	1.60
1	1.0000E+004 +/- 1.0000E+002	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	40.06	1.76
1	1.0753E+004 +/- 1.0753E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	38.74	1.67
1	1.0206E+004 +/- 1.0205E+002	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	37.97	1.85
1	8.6965E+003 +/- 8.6961E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	33.34	1.33



Plateau Report

Plateau: Plateau 1021

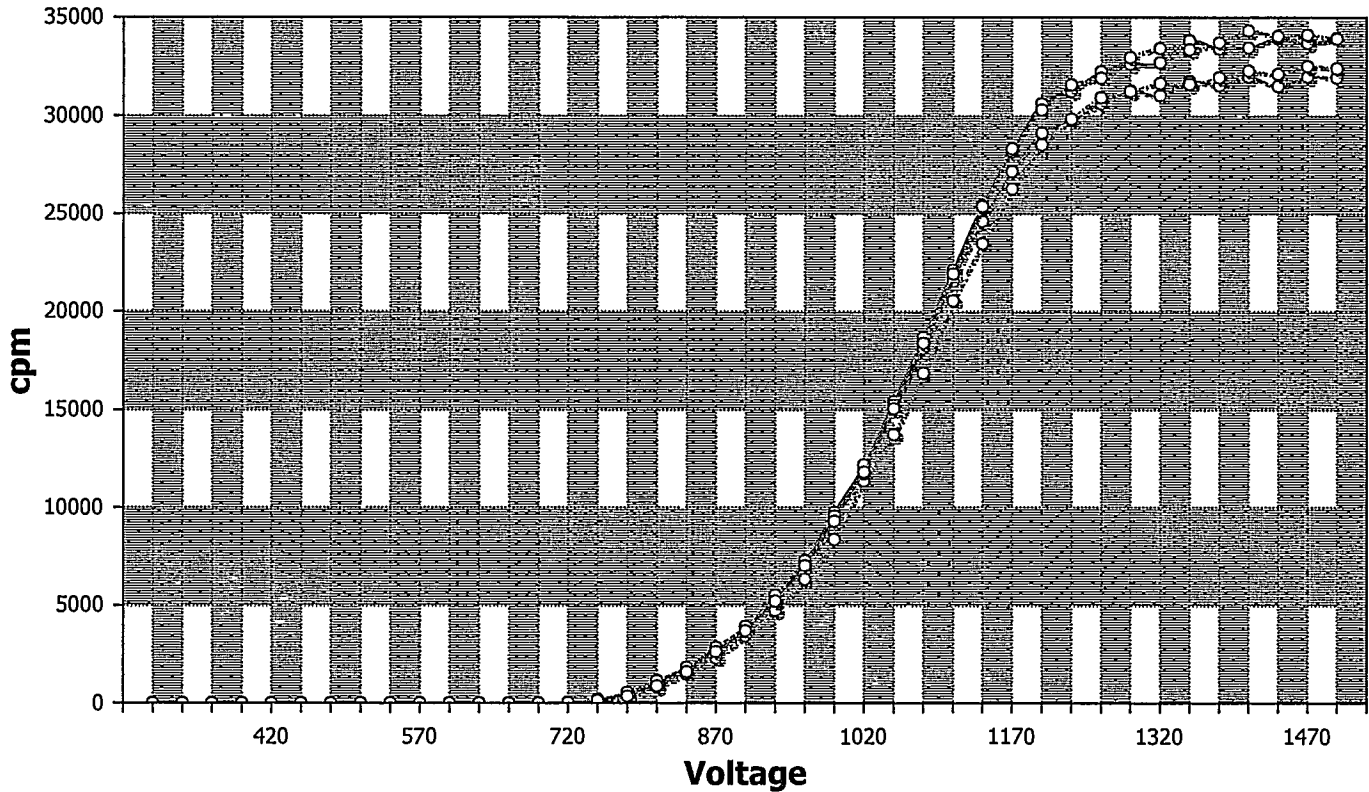
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Decay Mode: Beta

Drawer: LB 4200 C

Device: LB 4200 C

Operating Voltage: 1290



Iteration	C1		C2		C3		C4		Voltage
	cpm	Slope (%)	cpm	Slope (%)	cpm	Slope (%)	cpm	Slope (%)	
1	0		0		0		0		300
2	0		0		0		0		330
3	0	0	0	0	0	0	0	0	360
4	0	0	0	0	0	0	0	0	390
5	0	0	0	0	0	0	0	0	420
6	0	0	0	0	0	0	0	0	450
7	0	0	0	0	0	0	0	0	480
8	0	0	0	0	0	0	0	0	510
9	0	0	0	0	1	0	0	0	540
10	0	0	0	0	0	0	0	0	570
11	0	0	0	0	0	0	0	0	600
12	0	0	0	0	0	0	0	0	630
13	2	1233	1	2633	0	0	1	1567	660
14	4	3142	5	2920	0	0	3	3300	690
15	35	1059	37	1162	12	2289	22	1283	720
16	172	482.8	201	469.5	90	756.7	138	509.4	750
17	474	312.9	548	278.8	367	335.9	357	369.9	780
18	1030	207.9	1165	189.8	844	220.6	890	235.4	810
19	1831	149.9	1847	152.9	1484	171.7	1627	173.3	840
20	2706	128.7	2869	125.9	2324	140.1	2646	135.5	870

Plateau Review

Page 1 of 2

Iteration	C1		C2		C3		C4		Voltage
	cpm	Slope (%)	cpm	Slope (%)	cpm	Slope (%)	cpm	Slope (%)	
21	3754	118.8	3933	115.1	3449	117.3	3708	120.4	900
22	5292	110.8	5539	101	4747	105.2	5227	106.2	930
23	7229	98.21	7304	93.98	6340	102.2	7034	96.4	960
24	9763	85.98	9577	84.57	8370	91.66	9312	87.64	990
25	1.217E+04	78.31	1.221E+04	74.53	1.136E+04	77.62	1.184E+04	80.19	1020
26	1.541E+04	67.57	1.524E+04	65.33	1.375E+04	72.5	1.507E+04	70.39	1050
27	1.87E+04	59.33	1.813E+04	57.24	1.688E+04	61.32	1.84E+04	61.56	1080
28	2.212E+04	48.58	2.155E+04	46.92	2.056E+04	51.35	2.194E+04	50.94	1110
29	2.545E+04	37.51	2.461E+04	37.4	2.347E+04	41.23	2.539E+04	38.87	1140
30	2.816E+04	24.04	2.716E+04	25.69	2.629E+04	29.94	2.834E+04	24.39	1170
31	3.062E+04	12.15	2.913E+04	15.3	2.853E+04	19.41	3.03E+04	12.11	1200
32	3.125E+04	4.119	2.976E+04	7.382	2.983E+04	9.972	3.158E+04	3.709	1230
33	3.226E+04	0.2133	3.061E+04	2.473	3.093E+04	3.639	3.192E+04	0.1667	1260
34	3.262E+04	1.08	3.127E+04	1.748	3.126E+04	1.231	3.297E+04	0.871	1290
35	3.271E+04	2.848	3.104E+04	3.264	3.166E+04	2.572	3.342E+04	2.631	1320
36	3.382E+04	5.698	3.176E+04	5.53	3.161E+04	5.306	3.336E+04	5.227	1350
37	3.341E+04	9.297	3.156E+04	4.588	3.195E+04	6.153	3.371E+04	8.731	1380
38	3.346E+04	9.387	3.198E+04	3.4	3.229E+04	5.71	3.432E+04	10.28	1410
39	3.392E+04	7.237	3.151E+04	1.485	3.213E+04	3.524	3.404E+04	8.001	1440
40	3.371E+04		3.198E+04		3.252E+04		3.411E+04		1470
41	3.393E+04		3.194E+04		3.242E+04		3.392E+04		1500

Drawer C

Instrument: D 1155921

FEC 12787

Rf 1-4-22

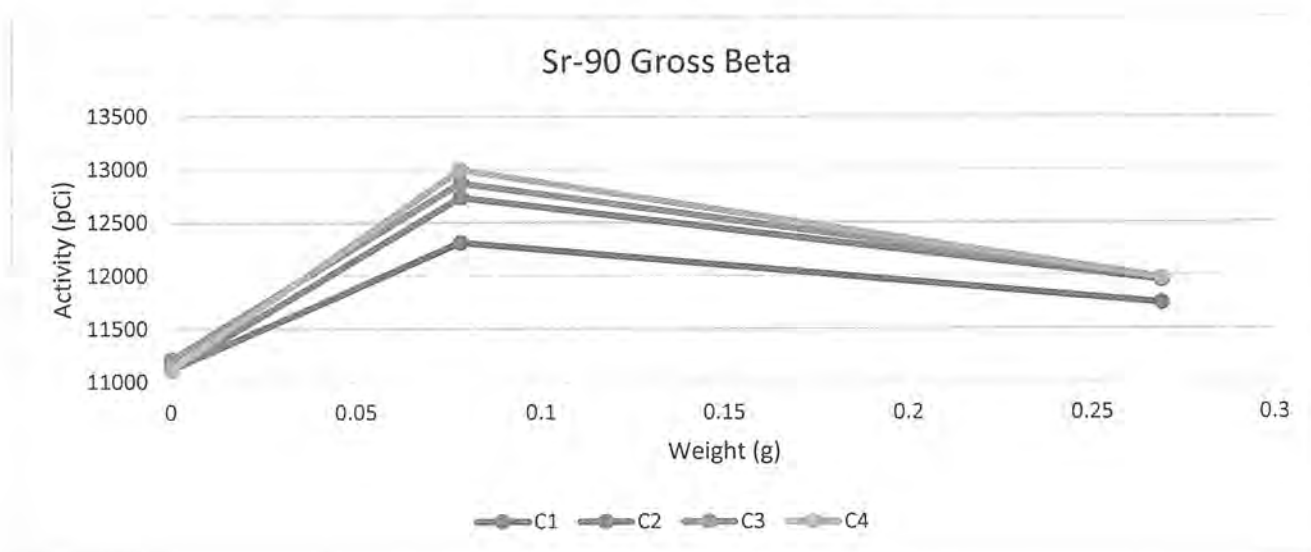
Rdw 1-4-22

Sr 90

Source ID	Decay corrected activity (DPM)	Weight
J589	21102.00	0.0001
J593	23886.00	0.0782
J595	22446.00	0.269

Detector	Source ID	Weight	Act (pCi)	CSU 2s	Low	High	Pass/Fail
C1	J589	0.0001	11118.73374	2616.10699	8502.62675	13734.84073	9505.41
C2	J593	0.0782	12735.50732	2996.59603	9738.91129	15732.10335	10759.46
C3	J595	0.269	11973.91867	2817.42306	9156.49561	14791.34173	10110.81
C4	J589	0.0001	11113.88219	2614.97053	8498.91166	13728.85272	9505.41
C1	J593	0.0782	12311.74140	2896.88765	9414.85375	15208.62905	10759.46
C2	J595	0.269	11951.53583	2812.44143	9139.09440	14763.97726	10110.81
C3	J589	0.0001	11212.23109	2638.10723	8574.12386	13850.33832	9505.41
C4	J593	0.0782	12995.81876	3057.88308	9937.93568	16053.70184	10759.46
C1	J595	0.269	11739.00418	2762.32478	8976.67940	14501.32896	10110.81
C2	J589	0.0001	11111.17459	2614.38690	8496.78769	13725.56149	9505.41
C3	J593	0.0782	12870.03429	3028.15178	9841.88251	15898.18607	10759.46
C4	J595	0.269	11973.30847	2817.31532	9155.99315	14790.62379	10110.81

Activity (pCi)				
Weight (g)	C1	C2	C3	C4
0.0001	11118.73	11111.17	11212.23	11113.88
0.0782	12311.74	12735.51	12870.03	12995.82
0.269	11739.00	11951.54	11973.92	11973.31



GPC D 1155921 Batch Report

Batch Name: B21-01749 5

Calibration: Fitted Efficiency

Procedure: Attenuation Curve check

Preset Count Time (min): 3

Batch ID: 2299

Count Mode: Simultaneous

Sample ID	Detector ID	Gross Alpha Counts (cpm)	Gross Beta Counts (cpm)	Alpha activity (uCi)	Beta activity (uCi)	Count Time (s)	Voltage (V)	Run Date & Time
B21-01749-04	C1	73	5000	-189.020989240271	22741.4658921404	180	1290	12/28/2021 9:37:26 AM
B21-01749-05	C2	82	5001	-246.776382269965	25822.2771109535	180	1290	12/28/2021 9:37:26 AM
B21-01749-06	C3	46	5001	-410.982886788373	21191.1874921864	180	1290	12/28/2021 9:37:26 AM
B21-01749-07	C4	0	7	-1.14385099806883	3.84533903666523	180	1290	12/28/2021 9:37:26 AM
B21-01749-08	C1	0	1	-0.70536955337241	-0.66574059794377	180	1290	12/28/2021 9:37:26 AM
B21-01749-09	C2	96	5000	-69.8262164140345	22701.1014563158	180	1290	12/28/2021 9:37:26 AM
B21-01749-10	C3	56	5000	-385.509248780945	26239.8480316951	180	1290	12/28/2021 9:37:26 AM
B21-01749-11	C4	51	5001	-387.535148899565	20865.374614435	180	1290	12/28/2021 9:37:26 AM
B21-01749-12	C1	68	5000	-223.955348424194	21093.550970303	180	1290	12/28/2021 9:37:26 AM
B21-01749-13	C2	0	7	-0.79072087060104	3.21429001372922	180	1290	12/28/2021 9:37:26 AM
B21-01749-14	C3	82	5000	-56.0141535162755	22742.5532568311	180	1290	12/28/2021 9:37:26 AM
B21-01749-15	C4	82	5000	-96.8152310207472	26377.111716796	180	1290	12/28/2021 9:37:26 AM
B21-01749-16	C1	76	5000	-174.605143542465	25209.1344497442	180	1290	12/28/2021 9:37:26 AM
B21-01749-17	C2	84	5001	-181.707833248127	21037.6437669907	180	1290	12/28/2021 9:37:26 AM
B21-01749-18	C3	2	6	3.29808748823179	2.75582012306986	180	1290	12/28/2021 9:37:26 AM
B21-01749-19	C4	80	5001	-106.075885591667	22833.3555217949	180	1290	12/28/2021 9:37:26 AM



Fitted Efficiency Report

Batch Name: D1 beta attenuation curve

Count Date: 12/23/2021 9:35:07 AM

Procedure: Beta Fitted Efficiency

Preset Count Time: 300

Calibration: Fitted Efficiency

Count Mode: Simultaneous

Decay Mode: Beta

Batch ID 2277

Detector: D1

Drawer: LB 4200 D

Device: LB 4200 D

Efficiency Coefficients

C0 = 4.2528E+001 +/- 3.0223E-001

C1 = -3.0408E+001 +/- 2.3042E+000

Chi^2 = 1.6574E+001

Spillover Coefficients

Spill C0 = 1.9398E+000 +/- 7.1515E-002

Spill C1 = -2.6233E+000 +/- 5.4455E-001

Chi^2 = 9.5874E-001

Decay Corrected

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.6154E+003 +/- 9.6154E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	39.21	2.09
1	1.2346E+004 +/- 1.2346E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	45.07	1.93
1	1.1364E+004 +/- 1.1364E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	43.97	1.61
1	1.0204E+004 +/- 1.0204E+002	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	40.88	1.87
1	1.0870E+004 +/- 1.0870E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	39.16	1.73
1	1.0526E+004 +/- 1.0526E+002	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	39.16	1.65
1	8.9286E+003 +/- 8.9286E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	34.23	1.25

Efficiency Coefficients

C0 = 4.2890E+001 +/- 3.1850E-001

C1 = -8.2393E+001 +/- 6.3781E+000

Chi^2 = 1.6990E+001

Spillover Coefficients

Spill C0 = 1.9827E+000 +/- 7.9000E-002

Spill C1 = -1.7503E+002 +/- 3.8564E+001

Chi^2 = 9.1239E-001

Decay Corrected

Exponential fit 12-23-21

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.6154E+003 +/- 9.6154E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	39.21	2.09
1	1.2346E+004 +/- 1.2346E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	45.07	1.93
1	1.1364E+004 +/- 1.1364E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	43.97	1.61
1	1.0204E+004 +/- 1.0204E+002	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	40.88	1.87
1	1.0870E+004 +/- 1.0870E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	39.16	1.73
1	1.0526E+004 +/- 1.0526E+002	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	39.16	1.65
1	8.9286E+003 +/- 8.9286E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	34.23	1.25



Fitted Efficiency Report

Batch Name: D2 beta attenuation curve

Count Date: 12/23/2021 9:38:21 AM

Procedure: Beta Fitted Efficiency

Preset Count Time: 300

Calibration: Fitted Efficiency

Count Mode: Simultaneous

Decay Mode: Beta

Batch ID 2278

Detector: D2

Drawer: LB 4200 D

Device: LB 4200 D

Efficiency Coefficients

C0 = 4.2784E+001 +/- 3.0483E-001

C1 = -2.9286E+001 +/- 2.3390E+000

Chi^2 = 1.5659E+001

Spillover Coefficients

Spill C0 = 1.9715E+000 +/- 7.3870E-002

Spill C1 = -1.0233E+000 +/- 6.0797E-001

Chi^2 = 4.5874E-001

Decay Corrected

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.7087E+003 +/- 9.7087E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	39.59	2.09
1	1.2346E+004 +/- 1.2346E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	45.07	1.87
1	1.1494E+004 +/- 1.1494E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	44.47	1.81
1	1.0309E+004 +/- 1.0309E+002	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	41.30	1.92
1	1.0990E+004 +/- 1.0990E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	39.59	1.91
1	1.0526E+004 +/- 1.0526E+002	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	39.16	1.96
1	9.0918E+003 +/- 9.0914E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	34.86	1.68

Efficiency Coefficients

C0 = 4.3125E+001 +/- 3.2025E-001

C1 = -7.8507E+001 +/- 6.3780E+000

Chi^2 = 1.5976E+001

Spillover Coefficients

Spill C0 = 1.9815E+000 +/- 7.6666E-002

Spill C1 = -5.7334E+001 +/- 3.4632E+001

Chi^2 = 4.6370E-001

Decay Corrected

Exponential Fitted

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.7087E+003 +/- 9.7087E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	39.59	2.09
1	1.2346E+004 +/- 1.2346E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	45.07	1.87
1	1.1494E+004 +/- 1.1494E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	44.47	1.81
1	1.0309E+004 +/- 1.0309E+002	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	41.30	1.92
1	1.0990E+004 +/- 1.0990E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	39.59	1.91
1	1.0526E+004 +/- 1.0526E+002	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	39.16	1.96
1	9.0918E+003 +/- 9.0914E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	34.86	1.68



Fitted Efficiency Report

Batch Name: D3 beta attenuation curve

Count Date: 12/23/2021 9:49:52 AM

Procedure: Beta Fitted Efficiency

Preset Count Time: 300

Calibration: Fitted Efficiency

Count Mode: Simultaneous

Decay Mode: Beta

Batch ID 2279

Detector: D3

Drawer: LB 4200 D

Device: LB 4200 D

Efficiency Coefficients

C0 = 4.0366E+001 +/- 2.8836E-001

C1 = -2.7732E+001 +/- 2.2204E+000

Chi^2 = 1.3698E+001

Spillover Coefficients

Spill C0 = 2.1139E+000 +/- 7.5345E-002

Spill C1 = -2.3424E+000 +/- 5.8913E-001

Chi^2 = 1.3565E+000

Decay Corrected

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.3467E+003 +/- 9.3463E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	38.12	2.15
1	1.1628E+004 +/- 1.1628E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	42.45	2.01
1	1.0871E+004 +/- 1.0870E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	42.06	2.01
1	9.5238E+003 +/- 9.5238E+001	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	38.16	2.01
1	1.0204E+004 +/- 1.0204E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	36.76	2.20
1	1.0000E+004 +/- 1.0000E+002	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	37.21	1.64
1	8.6207E+003 +/- 8.6207E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	33.05	1.51

Efficiency Coefficients

C0 = 4.0668E+001 +/- 3.0199E-001

C1 = -7.8668E+001 +/- 6.3780E+000

Chi^2 = 1.3756E+001

Spillover Coefficients

Spill C0 = 2.1449E+000 +/- 8.1471E-002

Spill C1 = -1.3155E+002 +/- 3.5806E+001

Chi^2 = 1.3467E+000

Decay Corrected

Exponential fit 12/23/21

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.3467E+003 +/- 9.3463E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	38.12	2.15
1	1.1628E+004 +/- 1.1628E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	42.45	2.01
1	1.0871E+004 +/- 1.0870E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	42.06	2.01
1	9.5238E+003 +/- 9.5238E+001	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	38.16	2.01
1	1.0204E+004 +/- 1.0204E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	36.76	2.20
1	1.0000E+004 +/- 1.0000E+002	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	37.21	1.64
1	8.6207E+003 +/- 8.6207E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	33.05	1.51



Fitted Efficiency Report

Batch Name: D4 beta attenuation curve

Count Date: 12/23/2021 9:53:18 AM

Procedure: Beta Fitted Efficiency

Preset Count Time: 300

Calibration: Fitted Efficiency

Count Mode: Simultaneous

Decay Mode: Beta

Batch ID 2280

Detector: D4

Drawer: LB 4200 D

Device: LB 4200 D

Efficiency Coefficients

C0 = 4.0307E+001 +/- 2.8660E-001

C1 = -3.0668E+001 +/- 2.1762E+000

Chi^2 = 1.7639E+001

Spillover Coefficients

Spill C0 = 1.8697E+000 +/- 7.2084E-002

Spill C1 = -1.2520E+000 +/- 5.9078E-001

Chi^2 = 7.0274E-001

Decay Corrected

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.1743E+003 +/- 9.1743E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	37.41	2.00
1	1.1765E+004 +/- 1.1765E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	42.95	1.95
1	1.0754E+004 +/- 1.0753E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	41.61	1.72
1	9.7097E+003 +/- 9.7092E+001	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	38.90	1.64
1	1.0309E+004 +/- 1.0309E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	37.14	1.80
1	9.6163E+003 +/- 9.6159E+001	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	35.78	1.73
1	8.4042E+003 +/- 8.4038E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	32.22	1.57

Efficiency Coefficients

C0 = 4.0691E+001 +/- 3.0217E-001

C1 = -8.8600E+001 +/- 6.3779E+000

Chi^2 = 1.7816E+001

Spillover Coefficients

Spill C0 = 1.8885E+000 +/- 7.4676E-002

Spill C1 = -7.8402E+001 +/- 3.5612E+001

Chi^2 = 6.8295E-001

Decay Corrected

Exponential Fitted 12-28-21

Iteration	Beta Count Rate (cpm)	Standard	Mass	Activity (dpm)	Reference Date	Efficiency	Spillover
1	9.1743E+003 +/- 9.1743E+001	J589	0.1 mg	2.4521E+004	9/1/1999 3:00:31 PM	37.41	2.00
1	1.1765E+004 +/- 1.1765E+002	J590	19.9 mg	2.7394E+004	9/1/1999 3:00:31 PM	42.95	1.95
1	1.0754E+004 +/- 1.0753E+002	J591	39 mg	2.5846E+004	9/1/1999 3:00:31 PM	41.61	1.72
1	9.7097E+003 +/- 9.7092E+001	J592	61.4 mg	2.4960E+004	9/1/1999 3:00:31 PM	38.90	1.64
1	1.0309E+004 +/- 1.0309E+002	J593	78.2 mg	2.7756E+004	9/1/1999 3:00:31 PM	37.14	1.80
1	9.6163E+003 +/- 9.6159E+001	J594	103.6 mg	2.6878E+004	9/1/1999 3:00:31 PM	35.78	1.73
1	8.4042E+003 +/- 8.4038E+001	J595	269 mg	2.6083E+004	9/1/1999 3:00:31 PM	32.22	1.57



Plateau Report

Plateau: Plateau 1013

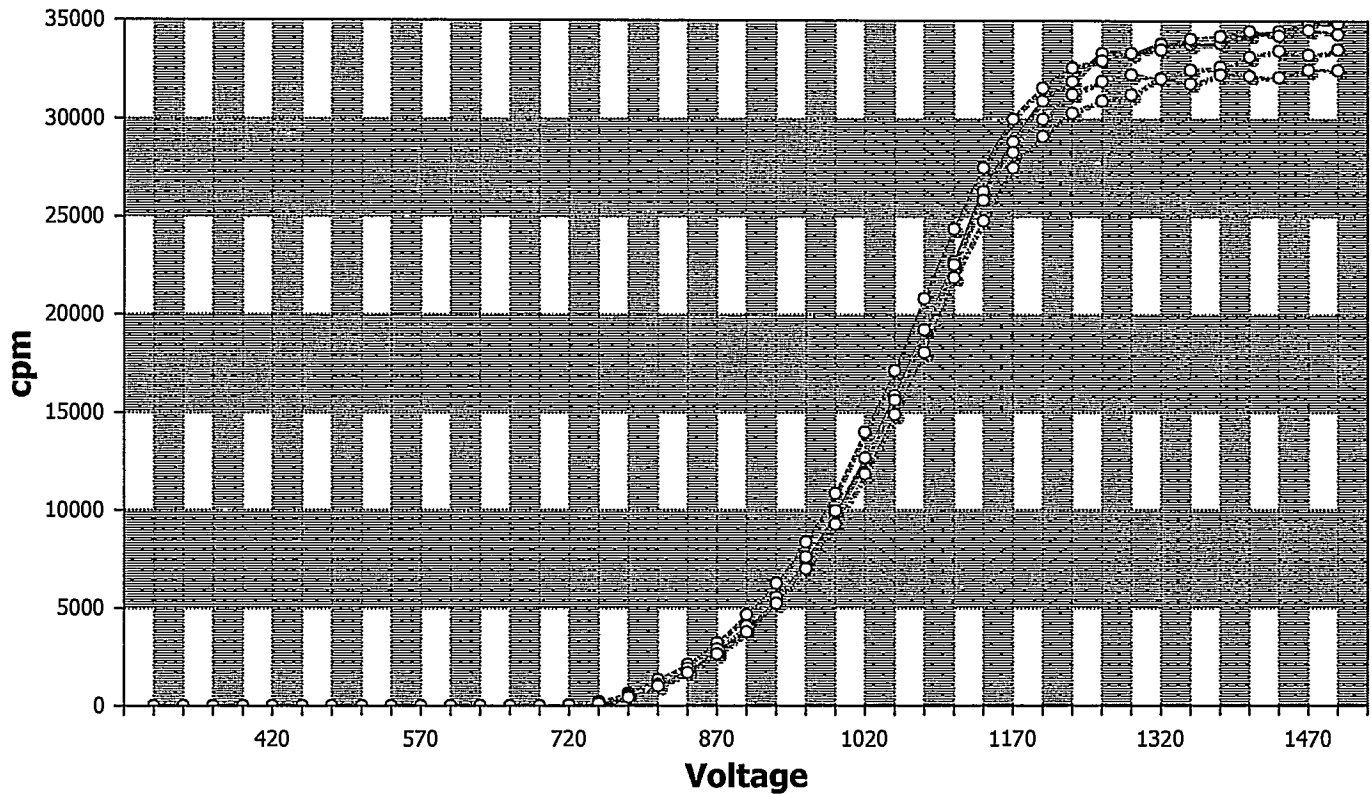
Plateau Date: 8/9/2021 12:00:44 PM

Decay Mode: Beta

Drawer: LB 4200 D

Device: LB 4200 D

Operating Voltage: 1230



Iteration	D1		D2		D3		D4		Voltage
	cpm	Slope (%)	cpm	Slope (%)	cpm	Slope (%)	cpm	Slope (%)	
1	0		0		0		0		300
2	0.5		0		0		0		330
3	0	0	0	0	0	0	0	0	360
4	0	0	0	0	0.5	0	0	0	390
5	0.5	0	0	0	0	0	0	0	420
6	0	0	0	0	0	0	0	0	450
7	0	0	0	0	0	0	0.5	0	480
8	0	0	0	0	0	0	0	0	510
9	0	0	0	0	0	0	0	0	540
10	0	0	0	0	0	0	0	0	570
11	0	0	0	0	0	0	0	0	600
12	0	0	0	0	0	0	0	0	630
13	0	0	0	0	0	0	0	0	660
14	2	4725	11.5	1491	4	3525	2	4475	690
15	29.5	1165	60.5	833.9	36	1197	31.5	1069	720
16	127	654.5	227	478.5	193.5	473.8	118.5	689	750
17	453	329.3	649	270.2	551.5	283.9	447	316.3	780
18	1037	214.9	1347	185.6	1122	201.9	1019	207.7	810
19	1812	157.8	2131	155.5	1921	153.8	1702	163	840
20	2791	131.9	3236	127.7	2905	126.6	2665	131.8	870

Plateau Review

Page 1 of 2

Iteration	D1		D2		D3		D4		Voltage
	cpm	Slope (%)	cpm	Slope (%)	cpm	Slope (%)	cpm	Slope (%)	
21	3866	120.8	4675	110.7	4089	114.2	3785	116.3	900
22	5533	106.2	6275	100.6	5556	106	5247	104.5	930
23	7446	97.84	8371	92.53	7602	94.79	7012	95.9	960
24	9811	82.03	1.086E+04	70.87	9979	80.08	9280	86.74	990
25	1.265E+04	53.47	1.4E+04	41.43	1.269E+04	52.07	1.185E+04	60.74	1020
26	1.587E+04	28.28	1.714E+04	20.64	1.563E+04	27.46	1.49E+04	32.64	1050
27	1.923E+04	10.43	2.083E+04	4.441	1.923E+04	10.29	1.807E+04	14.2	1080
28	2.273E+04	0.001111	2.439E+04	0.002222	2.256E+04	0.005555	2.19E+04	0.45	1110
29	2.632E+04	0.01444	2.752E+04	0	2.586E+04	0.001111	2.479E+04	-0.001111	1140
30	2.885E+04	0.005555	3E+04	0	2.83E+04	-0.003333	2.753E+04	0.001111	1170
31	3.093E+04	0.005554	3.158E+04	0	3E+04	-0.002222	2.913E+04	0.007778	1200
32	3.191E+04	0.008889	3.261E+04	0.06	3.125E+04	0.02556	3.03E+04	0.02222	1230
33	3.334E+04	0.2266	3.297E+04	0.4322	3.192E+04	0.3433	3.093E+04	0.3033	1260
34	3.334E+04	1.108	3.336E+04	1.704	3.227E+04	1.418	3.126E+04	1.336	1290
35	3.383E+04	3.074	3.354E+04	3.996	3.207E+04	3.595	3.206E+04	3.446	1320
36	3.383E+04	6.098	3.409E+04	7.342	3.252E+04	6.767	3.181E+04	6.742	1350
37	3.388E+04	9.817	3.422E+04	11.54	3.266E+04	10.59	3.227E+04	10.48	1380
38	3.432E+04	14.88	3.448E+04	16.65	3.318E+04	15.25	3.219E+04	14.87	1410
39	3.448E+04	21	3.425E+04	23.77	3.349E+04	22.06	3.213E+04	21.42	1440
40	3.494E+04		3.454E+04		3.327E+04		3.251E+04		1470
41	3.489E+04		3.433E+04		3.356E+04		3.25E+04		1500

Instrument: D 1155921

FEI 1-4-22

1-4-22

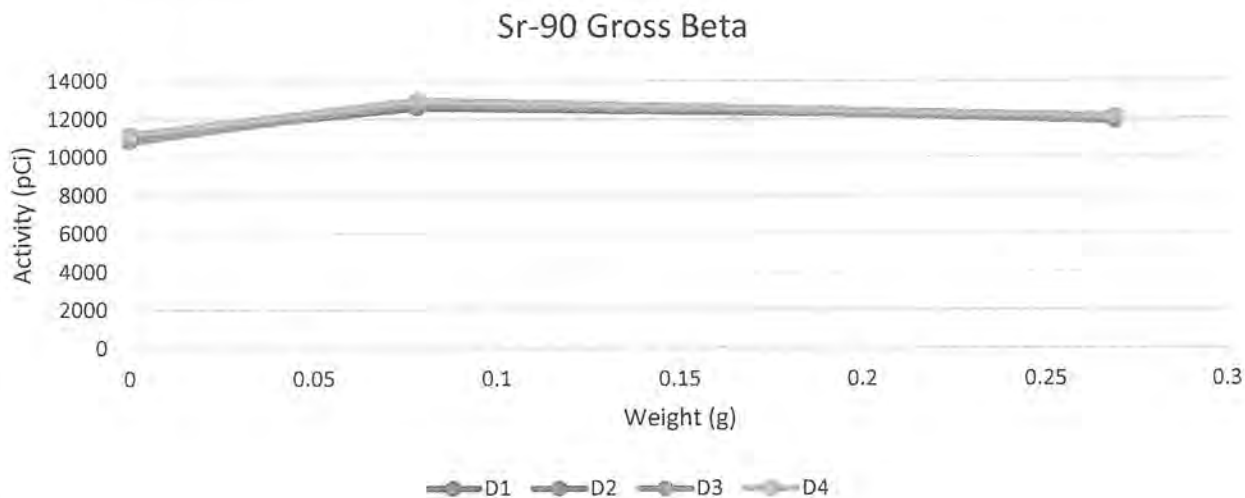
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Sr 90

Source ID	Decay corrected activity (DPM)	Weight
J589	21102.00	0.0001
J593	23886.00	0.0782
J595	22446.00	0.269

Detector	Source ID	Weight	Act (pCi)	CSU 2s	Low	High	Pass/Fail
D1	J589	0.0001	11122.22189	2616.91112	8505.31077	13739.13301	9505.41
D2	J593	0.0782	12720.73329	2993.14007	9727.59322	15713.87336	10759.46
D3	J595	0.269	11862.40289	2791.37945	9071.02344	14653.78234	10110.81
D4	J589	0.0001	11205.44072	2636.58122	8568.8595	13842.02194	9505.41
D1	J593	0.0782	12570.37427	2957.81273	9612.56154	15528.187	10759.46
D2	J595	0.269	12077.174	2841.8857	9235.2883	14919.0597	10110.81
D3	J589	0.0001	10797.62707	2540.65363	8256.97344	13338.2807	9505.41
D4	J593	0.0782	12983.41643	3054.95714	9928.45929	16038.37357	10759.46
D1	J595	0.269	12044.56995	2834.31451	9210.25544	14878.88446	10110.81
D2	J589	0.0001	11208.51511	2637.33123	8571.18388	13845.84634	9505.41
D3	J593	0.0782	12844.12556	3022.22361	9821.90195	15866.34917	10759.46
D4	J595	0.269	12134.90937	2855.62021	9279.28916	14990.52958	10110.81

Activity (pCi)				
Weight (g)	D1	D2	D3	D4
0.0001	11122.22	11208.52	10797.63	11205.44
0.0782	12570.37	12720.73	12844.13	12983.42
0.269	12044.57	12077.17	11862.40	12134.91



GPC D 1155921 Batch Report

Batch Name: B21-01757 3		Calibration: Fitted Efficiency						
Procedure: Attenuation Curve check		Preset Count Time (min): 3						
Batch ID: 2301		Count Mode: Simultaneous						
Sample ID	Detector ID	Gross Alpha Counts (cpm)	Gross Beta Counts (cpm)	Alpha activity (uCi)	Beta activity (uCi)	Count Time (s)	Voltage (V)	Run Date & Time
B21-01757-04	D1	68	5000	-314.786835081576	22456.965376398	180	1230	12/28/2021 10:24:26 AM
B21-01757-05	D4	0	5	-0.66043525028446	2.46871921223085	180	1230	12/28/2021 10:24:26 AM
B21-01757-06	D2	87	5000	-137.941150842681	25780.1330753865	180	1230	12/28/2021 10:24:26 AM
B21-01757-07	D3	69	5000	-375.768279809986	21241.6388990689	180	1230	12/28/2021 10:24:26 AM
B21-01757-08	D1	1	6	1.12702065141495	2.70667282342385	180	1230	12/28/2021 10:24:26 AM
B21-01757-09	D2	111	5000	119.569754691734	22717.0560910785	180	1230	12/28/2021 10:24:26 AM
B21-01757-10	D3	90	5000	-204.973141808604	25637.1347783541	180	1230	12/28/2021 10:24:26 AM
B21-01757-11	D4	81	5000	-133.369026547035	21200.0539133435	180	1230	12/28/2021 10:24:26 AM
B21-01757-12	D2	0	7	-0.59624081207084	3.6680996281069	180	1230	12/28/2021 10:24:26 AM
B21-01757-13	D1	79	5000	-192.632002961603	21218.6193410319	180	1230	12/28/2021 10:24:26 AM
B21-01757-14	D3	110	5000	27.9809687468218	22348.857606585	180	1230	12/28/2021 10:24:26 AM
B21-01757-15	D4	82	5000	-152.254670111202	26160.6851525756	180	1230	12/28/2021 10:24:26 AM
B21-01757-16	D3	0	27	-1.63467416496161	20.3920561391137	180	1230	12/28/2021 10:24:26 AM
B21-01757-17	D1	95	5001	-47.8446575258261	25352.3569348239	180	1230	12/28/2021 10:24:26 AM
B21-01757-18	D2	68	5000	-295.445784903571	21505.5134408925	180	1230	12/28/2021 10:24:26 AM
B21-01757-19	D4	100	5000	58.8055652210289	22746.250488281	180	1230	12/28/2021 10:24:26 AM



Sr-90 (Sr-90, Y-90) Calibration Verification

Sr-90																	
																	Sr-90 decay
																	Sr-90
																	half-life
																	days
																	to
																	count
																	midpoint
ID	Standard ID	Standard Specific Activity (dpm/g)	reference date	Mass added (g)	Total Activity Added (Sr-90 in DPM) on reference date	carrier added (mg as Sr)	g SrNO3/ g Sr	carrier expected (mg SrNO3)	planchet gross (g)	planchet tare (g)	planchet net (mg)	Chemical Yield	separation date/time	count date/time	count midpoint	Sr-90 half-life days	Sr-90 decay days to count midpoint
Sr- CAL-01	S-0121	7662.422	2/25/2022	1.012	7754.371	5.0000	2.4153	12.077	7.9511	7.9392	11.9	0.9854	2/25/2022 8:44	2/25/22 12:32	2/25/22 12:37 PM	10515.51	0.53
Sr- CAL-02	S-0121	7662.422	2/25/2022	1.007	7716.059	5.0000	2.4153	12.077	7.9694	7.9574	12.0	0.9937	2/25/2022 8:37	2/25/22 12:32	2/25/22 12:37 PM	10515.51	0.53
Sr- CAL-03	S-0121	7662.422	2/25/2022	1.006	7708.397	5.0000	2.4153	12.077	7.8872	7.8751	12.1	1.0019	2/25/2022 8:49	2/25/22 12:32	2/25/22 12:37 PM	10515.51	0.53
Sr- CAL-04	S-0121	7662.422	2/25/2022	1.004	7693.072	5.0000	2.4153	12.077	7.8317	7.8195	12.2	1.0102	2/25/2022 8:35	2/25/22 12:32	2/25/22 12:37 PM	10515.51	0.53
Sr- CAL-01	S-0121	7662.422	2/25/2022	1.012	7754.371	5.0000	2.4153	12.077	7.9511	7.9392	11.9	0.9854	2/25/2022 8:44	2/25/22 12:44	2/25/22 12:49 PM	10515.51	0.53
Sr- CAL-02	S-0121	7662.422	2/25/2022	1.007	7716.059	5.0000	2.4153	12.077	7.9694	7.9574	12.0	0.9937	2/25/2022 8:37	2/25/22 12:44	2/25/22 12:49 PM	10515.51	0.53
Sr- CAL-03	S-0121	7662.422	2/25/2022	1.006	7708.397	5.0000	2.4153	12.077	7.8872	7.8751	12.1	1.0019	2/25/2022 8:49	2/25/22 12:44	2/25/22 12:49 PM	10515.51	0.53
Sr- CAL-04	S-0121	7662.422	2/25/2022	1.004	7693.072	5.0000	2.4153	12.077	7.8317	7.8195	12.2	1.0102	2/25/2022 8:35	2/25/22 12:44	2/25/22 12:49 PM	10515.51	0.53
Sr- CAL-01	S-0121	7662.422	2/25/2022	1.012	7754.371	5.0000	2.4153	12.077	7.9511	7.9392	11.9	0.9854	2/25/2022 8:44	2/25/22 13:00	2/25/22 1:05 PM	10515.51	0.55
Sr- CAL-02	S-0121	7662.422	2/25/2022	1.007	7716.059	5.0000	2.4153	12.077	7.9694	7.9574	12.0	0.9937	2/25/2022 8:37	2/25/22 13:00	2/25/22 1:05 PM	10515.51	0.55
Sr- CAL-03	S-0121	7662.422	2/25/2022	1.006	7708.397	5.0000	2.4153	12.077	7.8872	7.8751	12.1	1.0019	2/25/2022 8:49	2/25/22 13:00	2/25/22 1:05 PM	10515.51	0.55
Sr- CAL-04	S-0121	7662.422	2/25/2022	1.004	7693.072	5.0000	2.4153	12.077	7.8317	7.8195	12.2	1.0102	2/25/2022 8:35	2/25/22 13:00	2/25/22 1:05 PM	10515.51	0.55
Sr- CAL-01	S-0121	7662.422	2/25/2022	1.012	7754.371	5.0000	2.4153	12.077	7.9511	7.9392	11.9	0.9854	2/25/2022 8:44	2/25/22 13:12	2/25/22 1:17 PM	10515.51	0.55
Sr- CAL-02	S-0121	7662.422	2/25/2022	1.007	7716.059	5.0000	2.4153	12.077	7.9694	7.9574	12.0	0.9937	2/25/2022 8:37	2/25/22 13:12	2/25/22 1:17 PM	10515.51	0.55
Sr- CAL-03	S-0121	7662.422	2/25/2022	1.006	7708.397	5.0000	2.4153	12.077	7.8872	7.8751	12.1	1.0019	2/25/2022 8:49	2/25/22 13:12	2/25/22 1:17 PM	10515.51	0.55
Sr- CAL-04	S-0121	7662.422	2/25/2022	1.004	7693.072	5.0000	2.4153	12.077	7.8317	7.8195	12.2	1.0102	2/25/2022 8:35	2/25/22 13:12	2/25/22 1:17 PM	10515.51	0.55

Y-90																		
ID	Standard ID	Standard Specific Activity (dpm/g)	collection date	Mass added (g)	Total Activity Added (Sr-90 in DPM)		carrier added (mg)	g SrNO3/ g Sr	carrier expected (mg)	planchet gross (g)	planchet tare (g)	planchet net (mg)	Yield	separation date	count date	Sr-90 half-life days	Sr-90 decay days	Sr decay correction to separation
Yt CAL-01	S-0121	7662.422	2/25/2022	1.012	7754.371	5.0000	2.4153	12.077	7.9511	7.9392	11.9	0.9854	2/25/2022 8:44	2/25/22 13:12	10515.51	0.36	0.99998	
Yt CAL-02	S-0121	7662.422	2/25/2022	1.007	7716.059	5.0000	2.4153	12.077	7.9694	7.9574	12.0	0.9937	2/25/2022 8:37	2/25/22 13:12	10515.51	0.36	0.99998	
Yt CAL-03	S-0121	7662.422	2/25/2022	1.006	7708.397	5.0000	2.4153	12.077	7.8872	7.8751	12.1	1.0019	2/25/2022 8:49	2/25/22 13:12	10515.51	0.37	0.99998	
Yt CAL-04	S-0121	7662.422	2/25/2022	1.004	7693.072	5.0000	2.4153	12.077	7.8317	7.8195	12.2	1.0102	2/25/2022 8:35	2/25/22 13:12	10515.51	0.36	0.99998	
Yt CAL-01	S-0121	7662.422	2/25/2022	1.012	7754.371	5.0000	2.4153	12.077	7.9511	7.9392	11.9	0.9854	2/25/2022 8:44	2/25/22 13:00	10515.51	0.36	0.99998	
Yt CAL-02	S-0121	7662.422	2/25/2022	1.007	7716.059	5.0000	2.4153	12.077	7.9694	7.9574	12.0	0.9937	2/25/2022 8:37	2/25/22 13:00	10515.51	0.36	0.99998	
Yt CAL-03	S-0121	7662.422	2/25/2022	1.006	7708.397	5.0000	2.4153	12.077	7.8872	7.8751	12.1	1.0019	2/25/2022 8:49	2/25/22 13:00	10515.51	0.37	0.99998	
Yt CAL-04	S-0121	7662.422	2/25/2022	1.004	7693.072	5.0000	2.4153	12.077	7.8317	7.8195	12.2	1.0102	2/25/2022 8:35	2/25/22 13:00	10515.51	0.36	0.99998	
Yt CAL-01	S-0121	7662.422	2/25/2022	1.012	7754.371	5.0000	2.4153	12.077	7.9511	7.9392	11.9	0.9854	2/25/2022 8:44	2/25/22 12:44	10515.51	0.36	0.99998	
Yt CAL-02	S-0121	7662.422	2/25/2022	1.007	7716.059	5.0000	2.4153	12.077	7.9694	7.9574	12.0	0.9937	2/25/2022 8:37	2/25/22 12:44	10515.51	0.36	0.99998	
Yt CAL-03	S-0121	7662.422	2/25/2022	1.006	7708.397	5.0000	2.4153	12.077	7.8872	7.8751	12.1	1.0019	2/25/2022 8:49	2/25/22 12:44	10515.51	0.37	0.99998	
Yt CAL-04	S-0121	7662.422	2/25/2022	1.004	7693.072	5.0000	2.4153	12.077	7.8317	7.8195	12.2	1.0102	2/25/2022 8:35	2/25/22 12:44	10515.51	0.36	0.99998	
Yt CAL-01	S-0121	7662.422	2/25/2022	1.012	7754.371	5.0000	2.4153	12.077	7.9511	7.9392	11.9	0.9854	2/25/2022 8:44	2/25/22 12:32	10515.51	0.36	0.99998	
Yt CAL-02	S-0121	7662.422	2/25/2022	1.007	7716.059	5.0000	2.4153	12.077	7.9694	7.9574	12.0	0.9937	2/25/2022 8:37	2/25/22 12:32	10515.51	0.36	0.99998	
Yt CAL-03	S-0121	7662.422	2/25/2022	1.006	7708.397	5.0000	2.4153	12.077	7.8872	7.8751	12.1	1.0019	2/25/2022 8:49	2/25/22 12:32	10515.51	0.37	0.99998	
Yt CAL-04	S-0121	7662.422	2/25/2022	1.004	7693.072	5.0000	2.4153	12.077	7.8317	7.8195	12.2	1.0102	2/25/2022 8:35	2/25/22 12:32	10515.51	0.36	0.99998	



Sr-90 (Sr-90, Y-90) Calibration Verification

Sr-90

ID	Sr decay correction to count midpoint	Sr-90 activity at count midpoint (DPM)	Y-90 half-life days	Y-90 ingrowth days to count midpoint	Y-90 ingrowth	Y-90 Eff (from below)	sample counts	sample time	bkg counts	bkg time min	net CPM	Detector	Sr-90 Eff
Sr- CAL-01	0.99997	7640.7	2.667	0.1618	0.04119	0.43397	28089	10.0	585.999	900.0	2808.2489	A1	0.34966
Sr- CAL-02	0.99997	7666.9	2.667	0.1667	0.04240	0.44561	27778	10.0	576.999	900.0	2777.1589	A2	0.34334
Sr- CAL-03	0.99997	7723.1	2.667	0.1583	0.04032	0.42272	26415	10.0	606.996	900.0	2640.8256	A3	0.32489
Sr- CAL-04	0.99997	7771.4	2.667	0.1681	0.04274	0.42507	28314	10.0	567	900.0	2830.7700	A4	0.34608
Sr- CAL-01	0.99996	7640.7	2.667	0.1701	0.04326	0.41611	27391	10.0	806.998	900.0	2738.2033	B1	0.34006
Sr- CAL-02	0.99996	7666.9	2.667	0.1750	0.04447	0.42890	27176	10.0	686.997	900.0	2716.8367	B2	0.33535
Sr- CAL-03	0.99996	7723.1	2.667	0.1667	0.04240	0.42004	26597	10.0	698.004	900.0	2658.9244	B3	0.32660
Sr- CAL-04	0.99996	7771.4	2.667	0.1764	0.04481	0.42015	27758	10.0	608.004	900.0	2775.1244	B4	0.33852
Sr- CAL-01	0.99996	7640.7	2.667	0.1812	0.04602	0.39014	27310	10.0	576	900.0	2730.3600	C1	0.33920
Sr- CAL-02	0.99996	7666.9	2.667	0.1861	0.04722	0.48124	29696	10.0	651.996	900.0	2968.8756	C2	0.36420
Sr- CAL-03	0.99996	7723.1	2.667	0.1778	0.04516	0.45234	27793	10.0	561.996	900.0	2778.6756	C3	0.33958
Sr- CAL-04	0.99996	7771.4	2.667	0.1875	0.04757	0.45142	29175	10.0	627.003	900.0	2916.8033	C4	0.35414
Sr- CAL-01	0.99996	7640.7	2.667	0.1896	0.04808	0.40224	30110	10.0	610.002	900.0	3010.3222	D1	0.37443
Sr- CAL-02	0.99996	7666.9	2.667	0.1944	0.04929	0.38513	29501	10.0	604.998	900.0	2949.4278	D2	0.36546
Sr- CAL-03	0.99996	7723.1	2.667	0.1861	0.04722	0.32948	27011	10.0	566.001	900.0	2700.4711	D3	0.33427
Sr- CAL-04	0.99996	7771.4	2.667	0.1958	0.04963	0.30668	28636	10.0	613.998	900.0	2862.9178	D4	0.35337

Y-90

ID	count midpoint	Sr-90 activity at count separation (DPM)	Y-90 decay days	Y-90 half- life days	Y-90 Decay	Y-90 Activity	sample counts	sample time	bkg counts	bkg time min	net CPM	Detector	Y-90 Eff
Yt CAL-01	2/25/22 1:17 PM	7640.8	0.1896	2.667	0.951916	7273.587	31572	10.0	585.999	900.0	3156.5489	A1	0.43397
Yt CAL-02	2/25/22 1:17 PM	7667.0	0.1944	2.667	0.950714	7289.254	32488	10.0	576.999	900.0	3248.1589	A2	0.44561
Yt CAL-03	2/25/22 1:17 PM	7723.2	0.1861	2.667	0.952776	7358.621	31113	10.0	606.996	900.0	3110.6256	A3	0.42272
Yt CAL-04	2/25/22 1:17 PM	7771.5	0.1958	2.667	0.950371	7385.997	31402	10.0	567	900.0	3139.5700	A4	0.42507
Yt CAL-01	2/25/22 1:05 PM	7640.8	0.1812	2.667	0.953980	7289.359	30341	10.0	806.998	900.0	3033.2033	B1	0.41611
Yt CAL-02	2/25/22 1:05 PM	7667.0	0.1861	2.667	0.952776	7305.061	31339	10.0	686.997	900.0	3133.1367	B2	0.42890
Yt CAL-03	2/25/22 1:05 PM	7723.2	0.1778	2.667	0.954842	7374.578	30984	10.0	698.004	900.0	3097.6244	B3	0.42004
Yt CAL-04	2/25/22 1:05 PM	7771.5	0.1875	2.667	0.952432	7402.013	31106	10.0	608.004	900.0	3109.9244	B4	0.42015
Yt CAL-01	2/25/22 12:49 PM	7640.8	0.1701	2.667	0.956739	7310.442	28527	10.0	576	900.0	2852.0600	C1	0.39014
Yt CAL-02	2/25/22 12:49 PM	7667.0	0.1750	2.667	0.955531	7326.189	35264	10.0	651.996	900.0	3525.6756	C2	0.48124
Yt CAL-03	2/25/22 12:49 PM	7723.2	0.1667	2.667	0.957603	7395.907	33461	10.0	561.996	900.0	3345.4756	C3	0.45234
Yt CAL-04	2/25/22 12:49 PM	7771.5	0.1764	2.667	0.955186	7423.422	33518	10.0	627.003	900.0	3351.1033	C4	0.45142
Yt CAL-01	2/25/22 12:37 PM	7640.8	0.1622	2.667	0.958727	7325.633	32421	11.0	610.002	900.0	2946.6859	D1	0.40224
Yt CAL-02	2/25/22 12:38 PM	7667.0	0.1674	2.667	0.957430	7340.750	33934	12.0	604.998	900.0	2827.1611	D2	0.38513
Yt CAL-03	2/25/22 12:38 PM	7723.2	0.1594	2.667	0.959420	7409.938	31747	13.0	566.001	900.0	2441.4480	D3	0.32948
Yt CAL-04	2/25/22 12:39 PM	7771.5	0.1694	2.667	0.956912	7436.834	31940	14.0	613.998	900.0	2280.7464	D4	0.30668

GPC D 1155921 Batch Report

Batch Name: Sr-90 LB4200 calibration A & B - 2-25-22 2

Calibration: Background

Procedure: Sr-90/Y-90 Calibration

Preset Count Time (min): 10

Batch ID: 2913

Count Mode: Simultaneous

Sample ID	Detector ID	Gross Alpha Counts (cpm)	Gross Beta Counts (cpm)	Alpha activity (uCi)	Beta activity (uCi)	Count Time (s)	Voltage (V)	Run Date & Time
Sr-90 cal-01	A1	235	28089	132.543923910145	6872.98877721911	600	1230	2/25/2022 12:32:27 PM
Sr-90 cal-02	A2	257	27778	142.941053260257	6660.28235000946	600	1230	2/25/2022 12:32:27 PM
Sr-90 cal-03	A3	213	26415	126.698936057707	6620.78230461453	600	1230	2/25/2022 12:32:27 PM
Sr-90 cal-04	A4	247	28314	142.666787872403	7147.31445262781	600	1230	2/25/2022 12:32:27 PM
Sr-90 cal-05	B1	482	27391	278.752598117741	6920.71350579457	600	1230	2/25/2022 12:32:27 PM
Sr-90 cal-06	B2	448	27176	255.851590890306	6647.40743586032	600	1230	2/25/2022 12:32:27 PM
Sr-90 cal-07	B3	394	26597	229.381156488721	6782.30200996277	600	1230	2/25/2022 12:32:27 PM
Sr-90 cal-08	B4	442	27758	252.637319711151	6938.35524427931	600	1230	2/25/2022 12:32:27 PM

GPC D 1155921 Batch Report

Batch Name: Sr-90 LB4200 calibration C & D - 2-25-22 2

Calibration: Background

Procedure: Sr-90/Y-90 Calibration

Preset Count Time (min): 10

Batch ID: 2914

Count Mode: Simultaneous

Sample ID	Detector ID	Gross Alpha Counts (cpm)	Gross Beta Counts (cpm)	Alpha activity (uCi)	Beta activity (uCi)	Count Time (s)	Voltage (V)	Run Date & Time
Sr-90 cal-01	C1	130	27310	70.8893028383472	6303.43817884813	600	1290	2/25/2022 1:00:39 PM
Sr-90 cal-02	C2	573	29696	327.076257051308	7124.71229135114	600	1290	2/25/2022 1:00:39 PM
Sr-90 cal-03	C3	424	27793	240.638148786547	6647.31074520444	600	1290	2/25/2022 1:00:39 PM
Sr-90 cal-04	C4	485	29175	248.379848884315	6601.12233456405	600	1290	2/25/2022 1:00:39 PM
Sr-90 cal-05	D1	482	30110	254.956379645119	7011.74389408193	600	1290	2/25/2022 1:00:39 PM
Sr-90 cal-06	D2	549	29501	283.426695487347	6727.52938002495	600	1290	2/25/2022 1:00:39 PM
Sr-90 cal-07	D3	506	27011	288.2068539221	6609.09324848414	600	1290	2/25/2022 1:00:39 PM
Sr-90 cal-08	D4	546	28636	310.660703828033	7094.09329005772	600	1290	2/25/2022 1:00:39 PM

GPC D 1155921 Batch Report

Batch Name: Y-90 LB4200 calibration A & B - 2-25-22 2

Calibration: Background

Procedure: Sr-90/Y-90 Calibration

Preset Count Time (min): 10

Batch ID: 2915

Count Mode: Simultaneous

Sample ID	Detector ID	Gross Alpha Counts (cpm)	Gross Beta Counts (cpm)	Alpha activity (uCi)	Beta activity (uCi)	Count Time (s)	Voltage (V)	Run Date & Time
Y-90 cal-01	A1	279	31572	157.360658599704	7725.23057689351	600	1230	2/25/2022 1:00:42 PM
Y-90 cal-02	A2	214	32488	119.024845905428	7789.59079080954	600	1230	2/25/2022 1:00:42 PM
Y-90 cal-03	A3	196	31113	116.586814400519	7798.31155947272	600	1230	2/25/2022 1:00:42 PM
Y-90 cal-04	A4	265	31402	153.063557838813	7926.81953950055	600	1230	2/25/2022 1:00:42 PM
Y-90 cal-05	B1	261	30341	150.94279690608	7666.07164686624	600	1230	2/25/2022 1:00:42 PM
Y-90 cal-06	B2	281	31339	160.478341607536	7665.70141420469	600	1230	2/25/2022 1:00:42 PM
Y-90 cal-07	B3	255	30984	148.457347473665	7900.99806281484	600	1230	2/25/2022 1:00:42 PM
Y-90 cal-08	B4	227	31106	129.748125734007	7775.21717085353	600	1230	2/25/2022 1:00:42 PM

GPC D 1155921 Batch Report

Batch Name: Y-90 LB4200 calibration C & D - 2-25-22 2

Calibration: Background

Procedure: Sr-90/Y-90 Calibration

Preset Count Time (min): 10

Batch ID: 2916

Count Mode: Simultaneous

Sample ID	Detector ID	Gross Alpha Counts (cpm)	Gross Beta Counts (cpm)	Alpha activity (uCi)	Beta activity (uCi)	Count Time (s)	Voltage (V)	Run Date & Time
Y-90 cal-01	C1	60	28527	32.7181397715449	6584.33470992313	600	1290	2/25/2022 12:32:27 PM
Y-90 cal-02	C2	251	35264	143.274241744989	8460.59584597948	600	1290	2/25/2022 12:32:27 PM
Y-90 cal-03	C3	185	33461	104.995418692243	8002.93832422861	600	1290	2/25/2022 12:32:27 PM
Y-90 cal-04	C4	231	33518	118.3005053449	7583.76755475297	600	1290	2/25/2022 12:32:27 PM
Y-90 cal-05	D1	81	32421	42.8453667038478	7549.90862803156	600	1290	2/25/2022 12:32:27 PM
Y-90 cal-06	D2	120	33934	61.9511902704583	7738.44893331638	600	1290	2/25/2022 12:32:27 PM
Y-90 cal-07	D3	95	31747	54.1099824557302	7767.90505200199	600	1290	2/25/2022 12:32:27 PM
Y-90 cal-08	D4	95	31940	54.0526865634856	7912.60440300473	600	1290	2/25/2022 12:32:27 PM



Sr Yield Calculation Sheet

Sample	Empty	Filled	Yield(mg)	% Recovery
1	7.9392	7.9511	11.9000	99
2	7.9574	7.9694	12.0000	99
3	7.8751	7.8872	12.1000	100
4	7.8195	7.8317	12.2000	101
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				

Sr (C 021) / Sr Name - 22-00122
 1.012 g
 1.007 g
 1.006 g
 1.004 g
 1 mL
 Time 2-25-22
 8:44
 8:37
 8:49
 8:35
 Balance 1114341663
 Pipette RU07688



Add / Edit **Secondary** Standards

Planning		Parent Standard Data			
Planning Comments	Dilute intermediate solution from S-0120 for use as calibration stock.	Parent Solution Reference #	7090 1189-4-2		
Target dpm/g (on dil. date)	11282	Parent Solution #	S-0120		
Target Final Volume mL	2000.00	Parent Principal Radionuclide	Sr-90	Half Life (Days)	10409.625
Appx mass g of Parent Sol'n	4.96012064284138	Parent Reference Date	04/01/2006 0:00		
Appx vol ml of Parent Sol'n	4.96210548503539	Parent Certified Act	2.049	Cert Act/Vol Units	uCi g
Expected Addition for Analysis g	1	Parent Cert Act Uncert 1 Sigma	0.03		
Standards Preparation / Dilution		Parent Sp. Gravity G/ML	0.9996		
Secondary Solution #	S-0121	Parent Supplier	Isotope Products Laboratories		
Dilution Date (New Ref Date)	03/31/2006 0:00	Parent Date Recvd	03/20/06		
Ampoule, Empty (g)		Parent Received By	A Bessix		
Ampoule/Solution Gross (g)		Parent Cert Exp Date	04/01/11		
Net Wt Removed (g)		Parent Matrix	.1M HCL		
Transfer Container, empty (g)	0	Certified dpm/g At Ref Date	4548780		
Container Plus Solution(g)	4.97	Certified dpm/g On 03/31/2006 0:00	4549082.90034541		
Net Wt Transferred (g)	4.97	Parent Comments	Primary Sr-90 Standard		
DPM Xferred On 03/31/2006 0:00	22608942.0147167	Parent Tech	B Steffens		
Diluent/matrix	.1M HCL	Is Primary	TRUE		
Diluent Density Cont, empty (g)		Is LCS	FALSE		
Test Mass of 5 ml of Diluent (g)		Is Tracer	FALSE		
Diluent Density Test - (g/mL)		Is Calib	TRUE		
Dilution Empty Container Mass (g)	1				
Dilution Full Cont g (if measured)	2005.002				
Dilution Final Volume ml (if measured)	2000				
Final Dilution Density (g/mL)	1.002001				
Final Dilution Measured Mass g	2004.002				
Comments	Solution for use as calibration stock standard.				
Final Dilution dpm/g	11281.8959335952				
Final Dil New Ref Date/Time	03/31/2006 0:00				



CERTIFICATE OF CALIBRATION BETA STANDARD SOLUTION

Radionuclide:	Sr-90	Customer:	AMERICAN RADIATION SERVICE
Half-life:	28.5 ± 0.2 years	P.O. No.:	06-0088
Catalog No.:	7090	Reference Date:	1-Apr-06 12:00 PST
Source No.:	1189-4-2	Contained Radioactivity:	10.25 µCi 379.3 kBq
		(Sr-90 only)	

Physical Description:

A. Mass of solution:	5.00125 g in 5 mL V-Vial
B. Chemical form:	SrCl ₂ in 0.1M HCl
C. Carrier content:	(10 µg Sr + 50 µg Y)/mL of solution
D. Density:	0.9996 g/mL @ 20°C

Radioimpurities:

None detected (Y-90 daughter in equilibrium)

Radionuclide Concentration: 2.049 µCi/g, 75.81 kBq/g

Method of Calibration:

This source was prepared from a weighed aliquot of solution whose activity in µCi/g was determined using a liquid scintillation counter.

Uncertainty of Measurement:

A. Type A (random) uncertainty:	± 0.4 %
B. Type B (systematic) uncertainty:	± 3.0 %
C. Uncertainty in aliquot weighing:	± 0.0 %
D. Total uncertainty at the 99% confidence level:	± 3.0 %

Notes:

- See reverse side for leak test(s) performed on this source.
- IPL participates in a NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay (and later NIST certification) of Standard Reference Materials (as in NRC Regulatory Guide 4.15).
- Nuclear data was taken from NCRP Report No. 58, 1985.
- This solution has a working life of 5 years.


Quality Control


Date

IPL Ref. No.: 1189-4

☒ **Standard Wipe Test**

The source was wiped over its entire surface with a moistened filter paper disk. After drying, the disk was checked for activity using a scintillation detector. There was $<0.001 \mu\text{Ci}$ beta-gamma and $<0.0001 \mu\text{Ci}$ alpha of removable activity.

☐ **Special Wipe Test**

The source was wiped over its entire surface with moistened polystyrene. The polystyrene was then dissolved in a liquid scintillation cocktail and counted in a liquid scintillation counter. There was $<0.001 \mu\text{Ci}$ beta-gamma and $<0.0001 \mu\text{Ci}$ alpha of removable activity.

☐ **Distilled Water Soak Test**

The source was immersed in distilled water and maintained at $50^\circ\text{C} \pm 5^\circ\text{C}$ for a minimum of four hours or room temperature ($20^\circ\text{C} \pm 5^\circ\text{C}$) for 24 hours. After removal of the source, the liquid was **a)** checked for activity using a liquid scintillation counter, or **b)** evaporated in a planchet and the residue checked for activity using a windowless proportional counter or end-window G.M. tube. There was $<0.001 \mu\text{Ci}$ beta-gamma and $<0.0001 \mu\text{Ci}$ alpha of removable activity.

☐ **Liquid Scintillation Soak Test**

The source was immersed for a minimum of 3 hours at room temperature in a liquid scintillation cocktail, which does not attack the source's outer surface material. The source was stored away from light to avoid photoluminescence. The sealed source was then removed and the activity of the liquid scintillation cocktail was measured. There was $<0.001 \mu\text{Ci}$ beta-gamma and $<0.0001 \mu\text{Ci}$ alpha of removable activity.

☐ **Gas Source Test**

The source was placed in a vacuum desiccator and maintained at a pressure of $<10 \text{ mm Hg}$ for not less than 12 hours. The activity was checked by introducing air into the desiccator and monitoring the air with an end-window G.M. tube. There was $<0.001 \mu\text{Ci}$ beta-gamma of removable activity.

☐ **Ampoule Leak Test**

The ampoule was kept in an inverted position on a filter paper disk or polystyrene wipe for a minimum of 16 hours. The wipe was then checked for activity using a scintillation detector or liquid scintillation counter. There was $<0.001 \mu\text{Ci}$ beta-gamma and $<0.0001 \mu\text{Ci}$ alpha of removable activity.

☐ **Bubble Leak Test**

The container was pressurized to its fill pressure; then soapy water was applied over its valve and neck or, the valve and neck of the vessel were immersed in water. If no growing bubbles were observed, the container was considered leak free.

☐ **Wipe Test for Industrial Ni-63 Sources**

The sources were wipe tested by an approved sampling plan, which called for either 100% of the batch to be individually wipe tested, or, a subset thereof. The wipe test(s) used to test for removable contamination and the results of those tests are recorded on the front of this form.

☐ **Pressure Test for Triotech Kr-85 Sources**

Prior to filling the vessel with Kr-85 gas, the vessel was evacuated to $<5 \text{ mm Hg}$, the gas manifold system shut off and the system allowed to stand for a minimum of 30 minutes. A vacuum difference not greater than the known vacuum loss of the manifold system itself signified the vessel did not leak.

☐ **Leak Test Not Applicable**

The active area of the source is uncovered or is protected by a very thin coating. Although the deposit is adherent, it is not designed or certified to pass a standard leak test. The inactive portions of the source have been checked using the standard wipe test or special wipe test depending on the nuclide. There was $<0.001 \mu\text{Ci}$ beta-gamma and $<0.0001 \mu\text{Ci}$ alpha of removable activity.

☐ **Other Leak Test**



ARS Aleut Analytical, LLC Analytical Reports

for

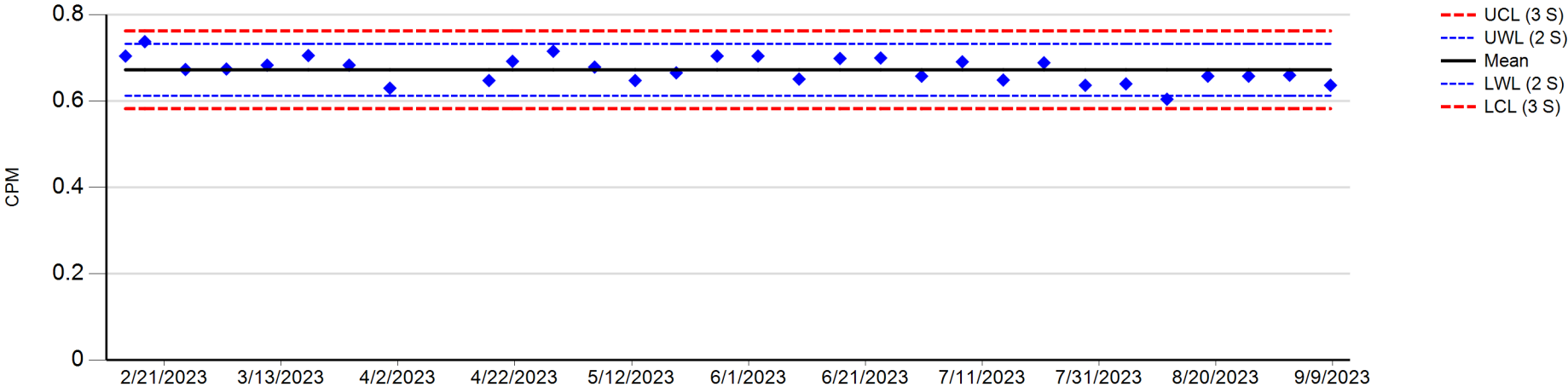
GES-AIS, LLC

Sr-90 - CCV

Population Statistics		Trending Analysis			
Population Size	30	Date	9/8/2023	Most recent point outside of the 3-sigma values.	OK
Average	0.6726	CPM	0.6367	8 consecutive most recent points on one side of the mean.	OK
Standard Deviation	0.0300	Count Mins	900.00	2 of 3 most recent points above 2 sigma.	OK
+ 3-sigma value	0.7627	Date	9/1/2023	4 of 5 most recent points beyond the 1-sigma.	OK
- 3-sigma value	0.5825	CPM	0.6600	7 trending most recent points in a row.	OK
		Count Mins	900.00	15 most recent points inside 1 sigma.	OK
				8 most recent points outside 1 sigma.	OK

LB4200-D - BETA LONG BACKGROUND - DETECTOR A3

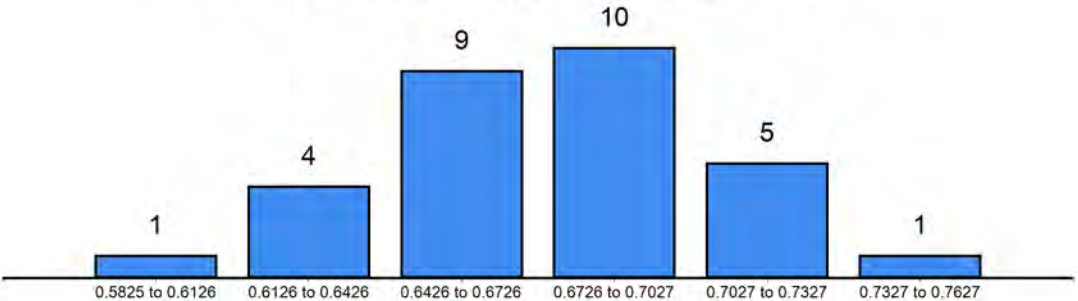
Process Date Range: 02/14/23 - 09/08/23



Statistical Process Control

Bin	Frequency
0.5825 to 0.6126	1
0.6126 to 0.6426	4
0.6426 to 0.6726	9
0.6726 to 0.7027	10
0.7027 to 0.7327	5
0.7327 to 0.7627	1

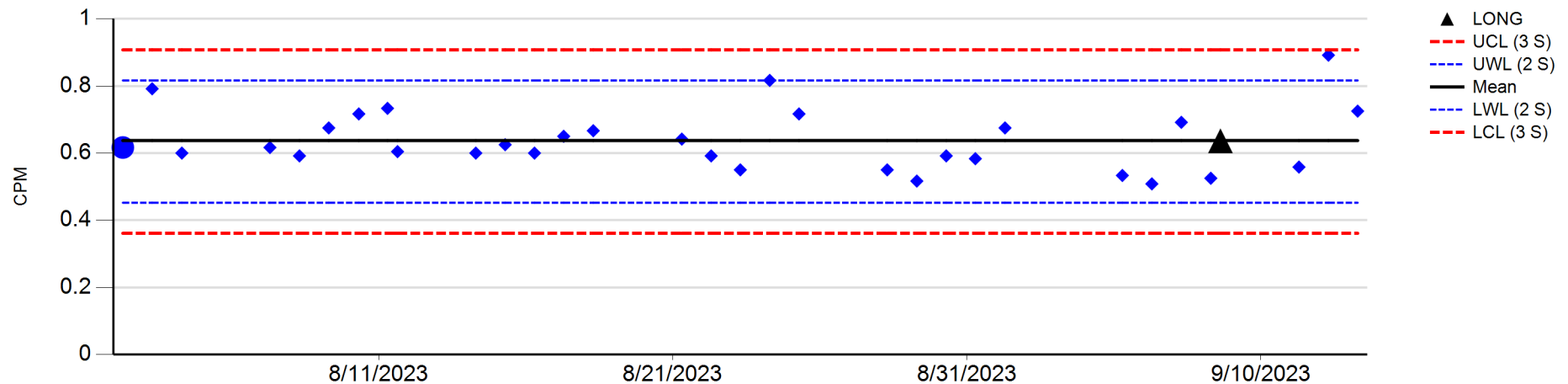
Population Frequency Distribution (Histogram)



Population Statistics		Trending Analysis			
Population Size	30	Long B Date	9/8/2023	Most recent point outside of the 3-sigma values.	OK
Average	0.6343	Long B CPM	0.6367	8 consecutive most recent points on one side of the mean.	OK
Standard Deviation	0.0911	Count Mins	900.00	2 of 3 most recent points above 2 sigma.	OK
+ 3-sigma value	0.9076	Date	9/12/2023	4 of 5 most recent points beyond the 1-sigma.	OK
- 3-sigma value	0.3611	CPM	0.8917	7 trending most recent points in a row.	OK
DER	2.8267	Count Mins	120.00	15 most recent points inside 1 sigma.	OK
DER Analysis	OK			8 most recent points outside 1 sigma.	OK

LB4200-D - BETA DAILY BACKGROUND - DETECTOR A3

Process Date Range: 08/02/23 - 09/13/23

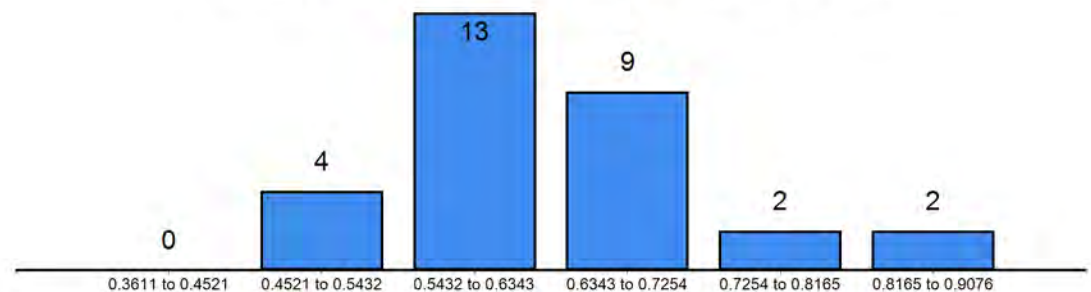


Statistical Process Control

ARS1-23-01973

Bin	Frequency
0.3611 to 0.4521	0
0.4521 to 0.5432	4
0.5432 to 0.6343	13
0.6343 to 0.7254	9
0.7254 to 0.8165	2
0.8165 to 0.9076	2

Population Frequency Distribution (Histogram)

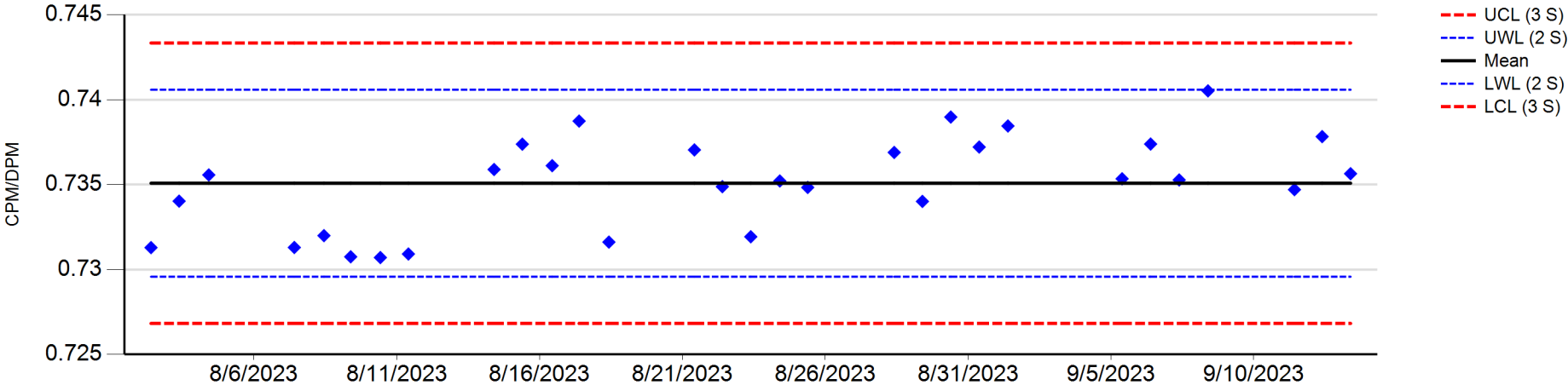


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Population Statistics		Trending Analysis			
Population Size	30	Date	9/13/2023	Most recent point outside of the 3-sigma values.	OK
Average	0.7351	CPM/DPM	0.7356	8 consecutive most recent points on one side of the mean.	OK
Standard Deviation	0.0028			2 of 3 most recent points above 2 sigma.	OK
+ 3-sigma value	0.7433			4 of 5 most recent points beyond the 1-sigma.	OK
- 3-sigma value	0.7268			7 trending most recent points in a row.	OK
				15 most recent points inside 1 sigma.	OK
				8 most recent points outside 1 sigma.	OK

LB4200-D - BETA EFFICIENCY - DETECTOR A3

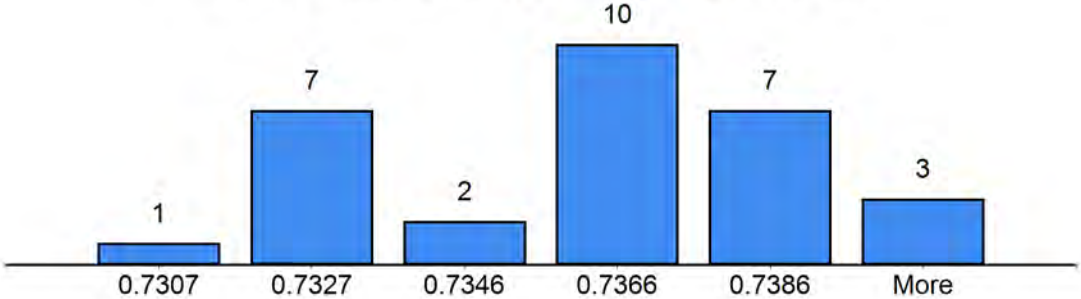
Process Date Range: 08/02/23 - 09/13/23



Statistical Process Control

Bin	Frequency
0.7307	1
0.7327	7
0.7346	2
0.7366	10
0.7386	7
More	3

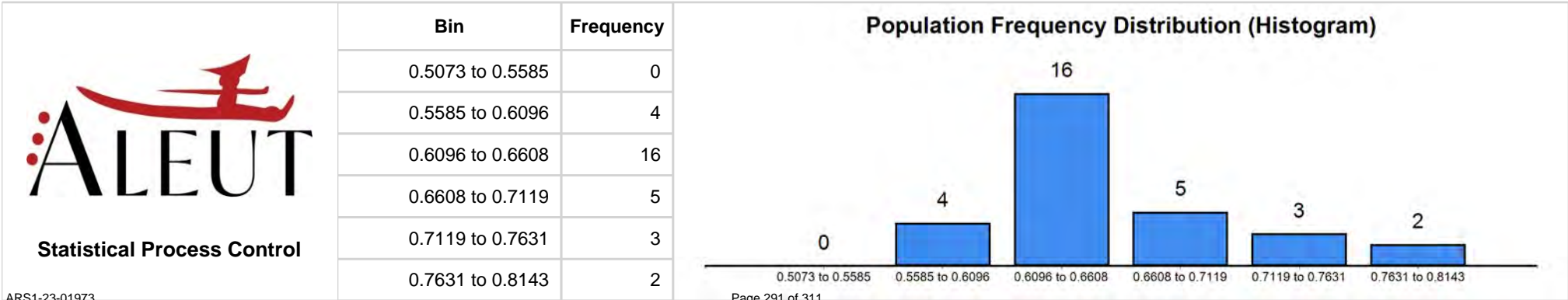
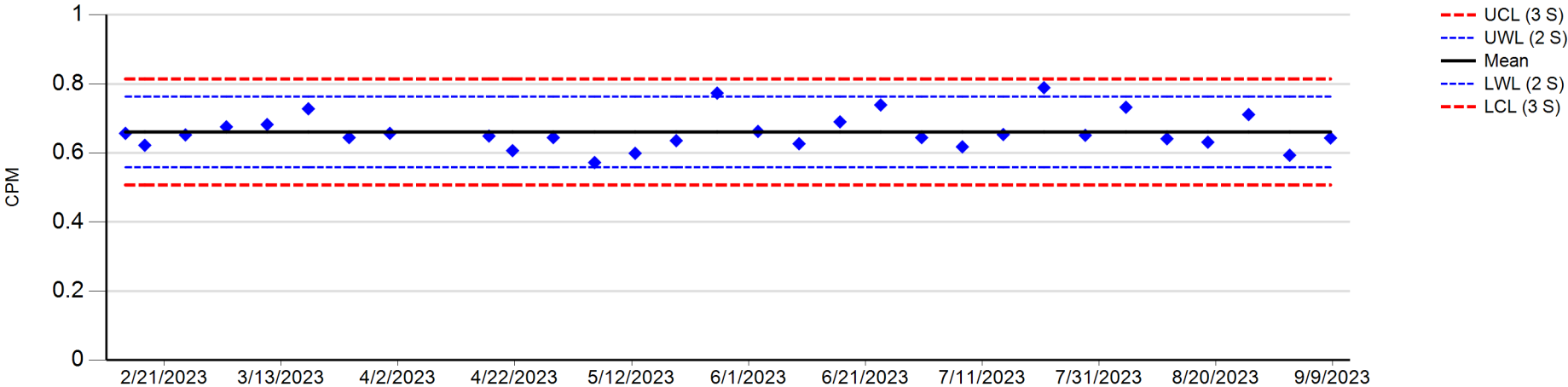
Population Frequency Distribution (Histogram)



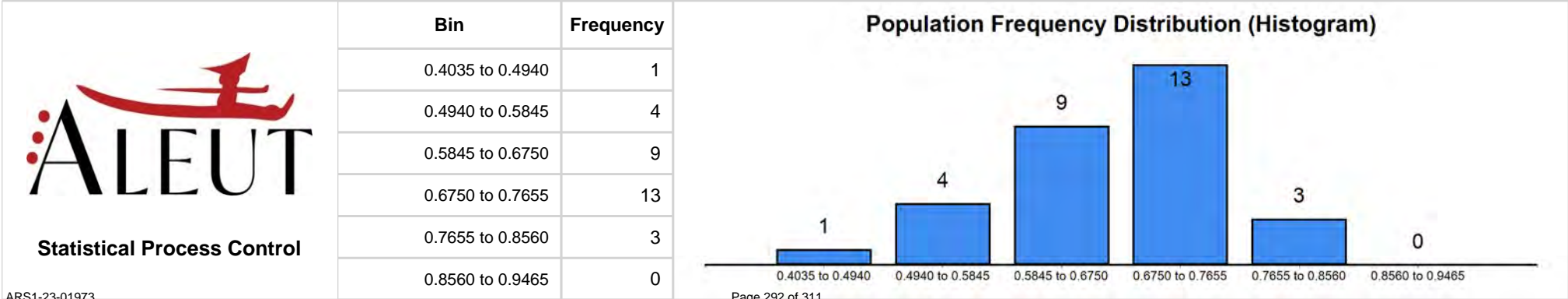
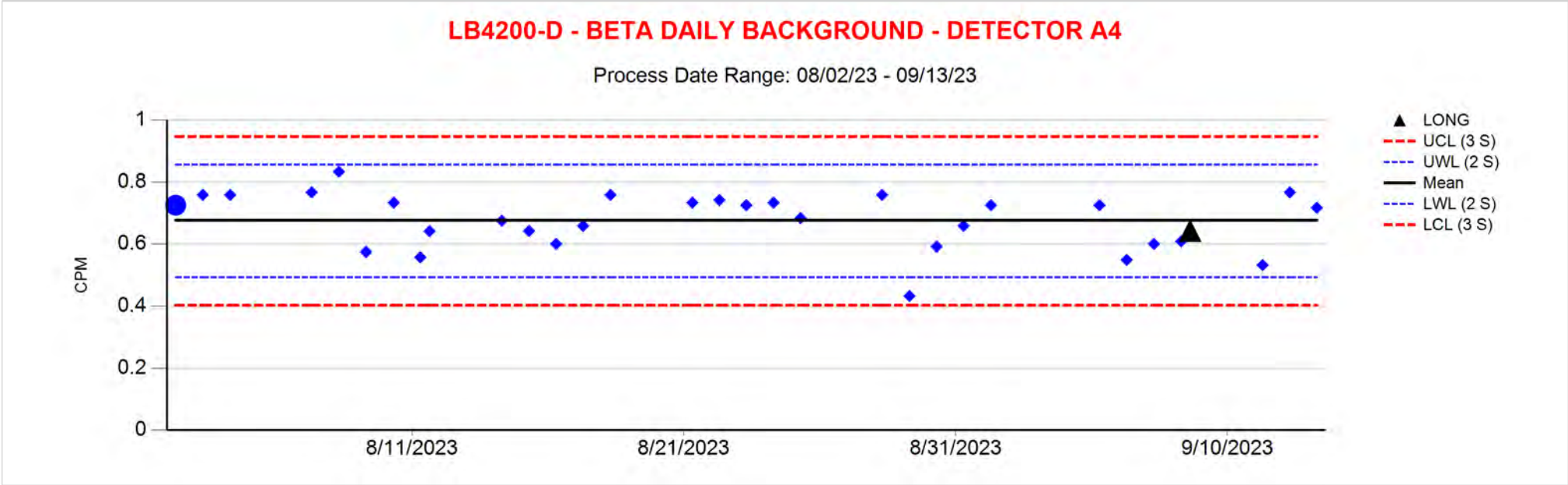
Population Statistics		Trending Analysis			
Population Size	30	Date	9/8/2023	Most recent point outside of the 3-sigma values.	OK
Average	0.6608	CPM	0.6433	8 consecutive most recent points on one side of the mean.	OK
Standard Deviation	0.0512	Count Mins	900.00	2 of 3 most recent points above 2 sigma.	OK
+ 3-sigma value	0.8143	Date	9/1/2023	4 of 5 most recent points beyond the 1-sigma.	OK
- 3-sigma value	0.5073	CPM	0.5933	7 trending most recent points in a row.	OK
		Count Mins	900.00	15 most recent points inside 1 sigma.	OK
				8 most recent points outside 1 sigma.	OK

LB4200-D - BETA LONG BACKGROUND - DETECTOR A4

Process Date Range: 02/14/23 - 09/08/23



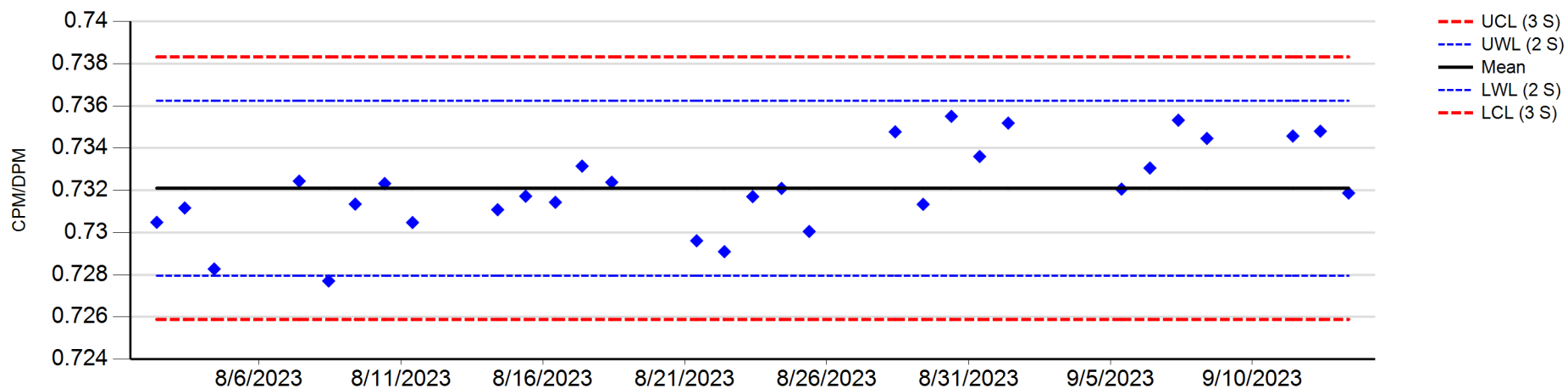
Population Statistics				Trending Analysis	
Population Size	30	Long B Date	9/8/2023	Most recent point outside of the 3-sigma values.	OK
Average	0.6750	Long B CPM	0.6433	8 consecutive most recent points on one side of the mean.	OK
Standard Deviation	0.0905	Count Mins	900.00	2 of 3 most recent points above 2 sigma.	OK
+ 3-sigma value	0.9465	Date	9/12/2023	4 of 5 most recent points beyond the 1-sigma.	OK
- 3-sigma value	0.4035	CPM	0.7667	7 trending most recent points in a row.	OK
DER	1.4633	Count Mins	120.00	15 most recent points inside 1 sigma.	OK
DER Analysis	OK			8 most recent points outside 1 sigma.	OK



Population Statistics				Trending Analysis	
Population Size	30	Date	9/13/2023	Most recent point outside of the 3-sigma values.	OK
Average	0.7321	CPM/DPM	0.7319	8 consecutive most recent points on one side of the mean.	OK
Standard Deviation	0.0021			2 of 3 most recent points above 2 sigma.	OK
+ 3-sigma value	0.7383			4 of 5 most recent points beyond the 1-sigma.	INVESTIGATE
- 3-sigma value	0.7259			7 trending most recent points in a row.	OK
				15 most recent points inside 1 sigma.	OK
				8 most recent points outside 1 sigma.	OK

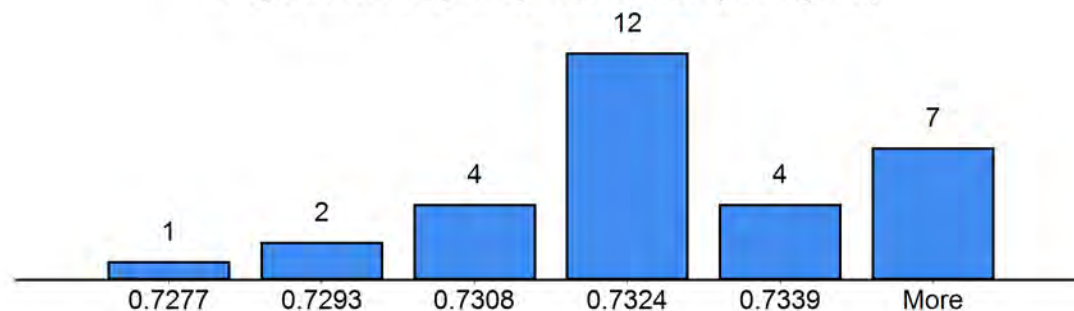
LB4200-D - BETA EFFICIENCY - DETECTOR A4

Process Date Range: 08/02/23 - 09/13/23



Statistical Process Control

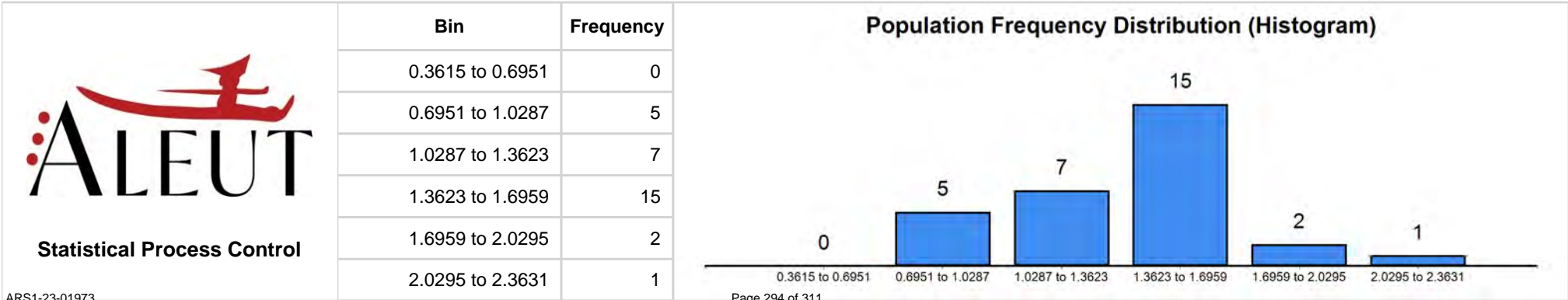
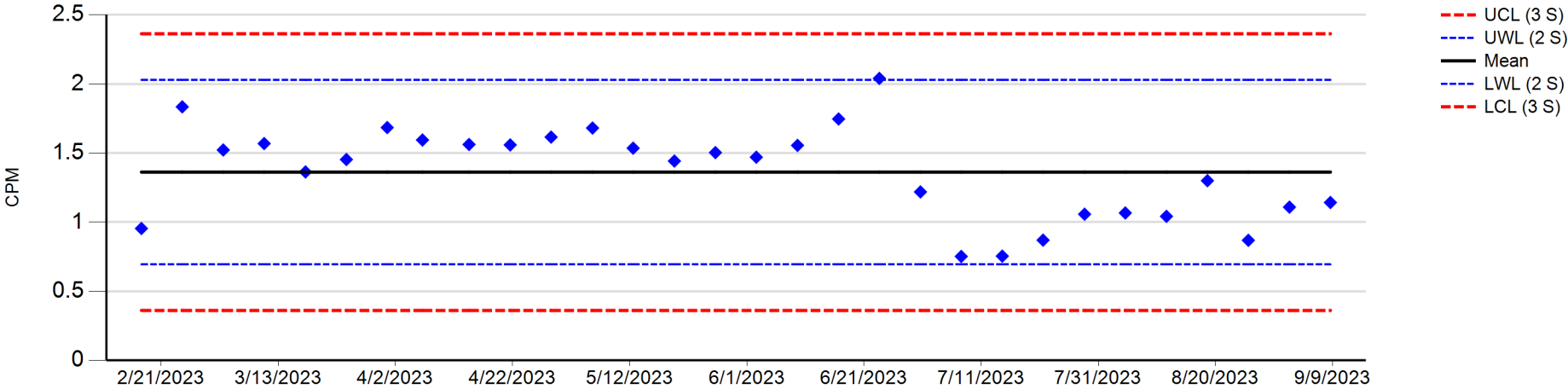
Bin	Frequency
0.7277	1
0.7293	2
0.7308	4
0.7324	12
0.7339	4
More	7

Population Frequency Distribution (Histogram)

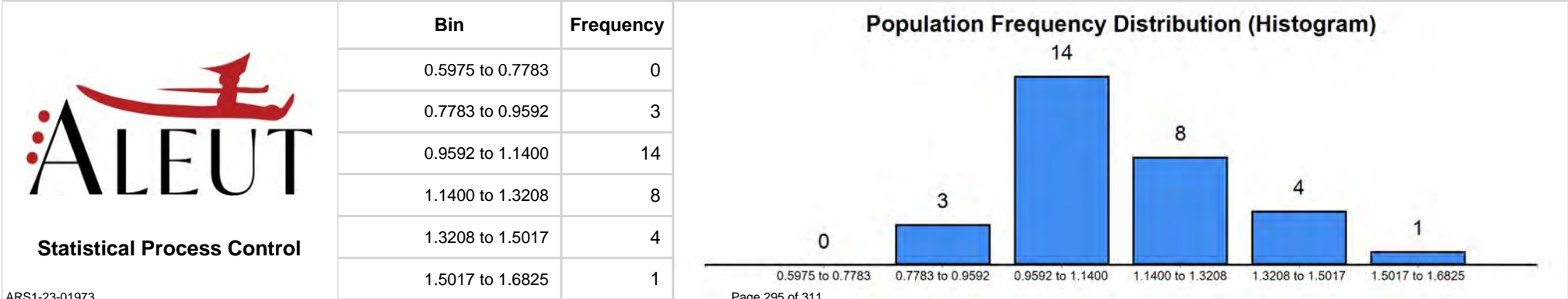
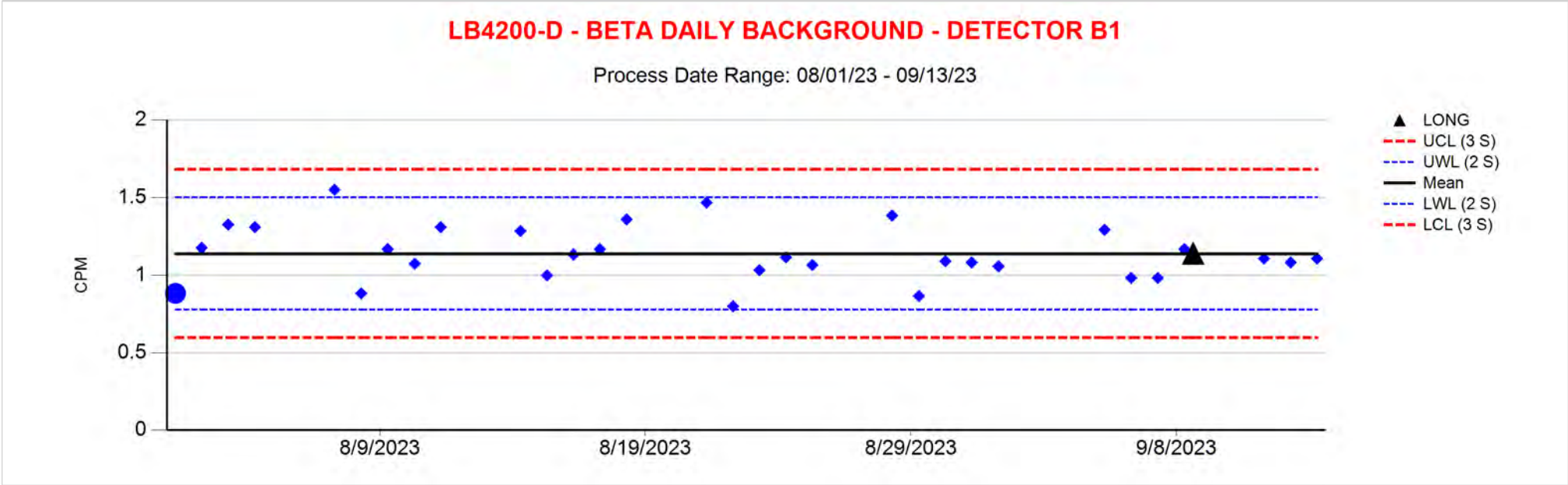
Population Statistics				Trending Analysis	
Population Size	30	Date	9/8/2023	Most recent point outside of the 3-sigma values.	OK
Average	1.3623	CPM	1.1422	8 consecutive most recent points on one side of the mean.	INVESTIGATE
Standard Deviation	0.3336	Count Mins	900.00	2 of 3 most recent points above 2 sigma.	OK
+ 3-sigma value	2.3631	Date	9/1/2023	4 of 5 most recent points beyond the 1-sigma.	OK
- 3-sigma value	0.3615	CPM	1.1089	7 trending most recent points in a row.	OK
		Count Mins	900.00	15 most recent points inside 1 sigma.	OK
				8 most recent points outside 1 sigma.	OK

LB4200-D - BETA LONG BACKGROUND - DETECTOR B1

Process Date Range: 02/17/23 - 09/08/23



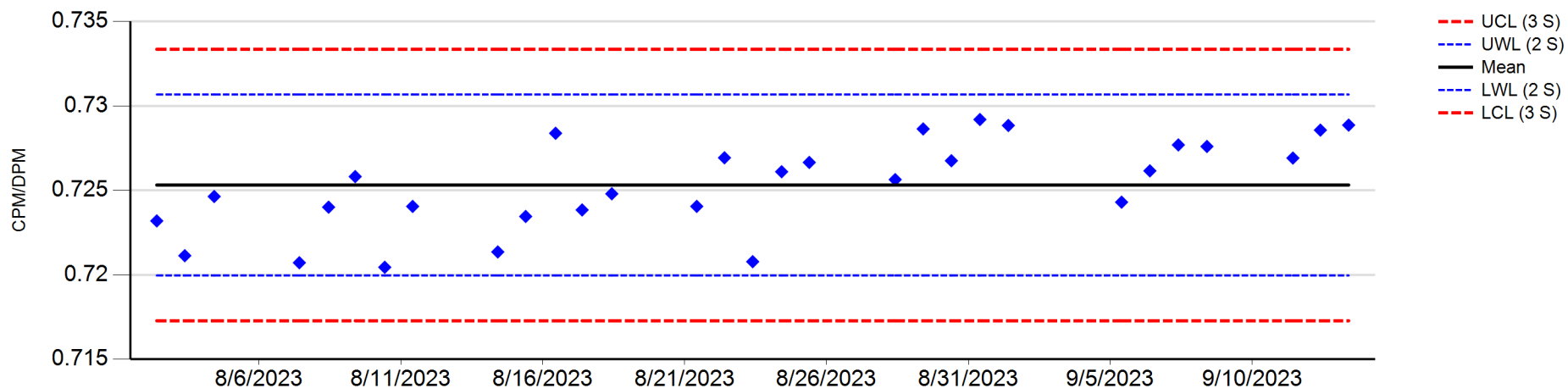
Population Statistics		Trending Analysis			
Population Size	30	Long B Date	9/8/2023	Most recent point outside of the 3-sigma values.	OK
Average	1.1400	Long B CPM	1.1422	8 consecutive most recent points on one side of the mean.	OK
Standard Deviation	0.1808	Count Mins	900.00	2 of 3 most recent points above 2 sigma.	OK
+ 3-sigma value	1.6825	Date	9/12/2023	4 of 5 most recent points beyond the 1-sigma.	OK
- 3-sigma value	0.5975	CPM	1.0833	7 trending most recent points in a row.	OK
DER	0.5803	Count Mins	120.00	15 most recent points inside 1 sigma.	OK
DER Analysis	OK			8 most recent points outside 1 sigma.	OK



Population Statistics		Trending Analysis			
Population Size	30	Date	9/13/2023	Most recent point outside of the 3-sigma values.	OK
Average	0.7253	CPM/DPM	0.7289	8 consecutive most recent points on one side of the mean.	OK
Standard Deviation	0.0027			2 of 3 most recent points above 2 sigma.	OK
+ 3-sigma value	0.7334			4 of 5 most recent points beyond the 1-sigma.	OK
- 3-sigma value	0.7173			7 trending most recent points in a row.	OK
				15 most recent points inside 1 sigma.	OK
				8 most recent points outside 1 sigma.	OK

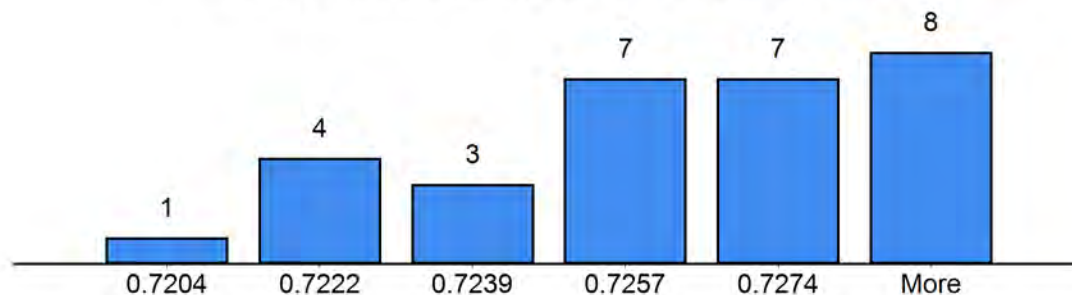
LB4200-D - BETA EFFICIENCY - DETECTOR B1

Process Date Range: 08/02/23 - 09/13/23



Statistical Process Control

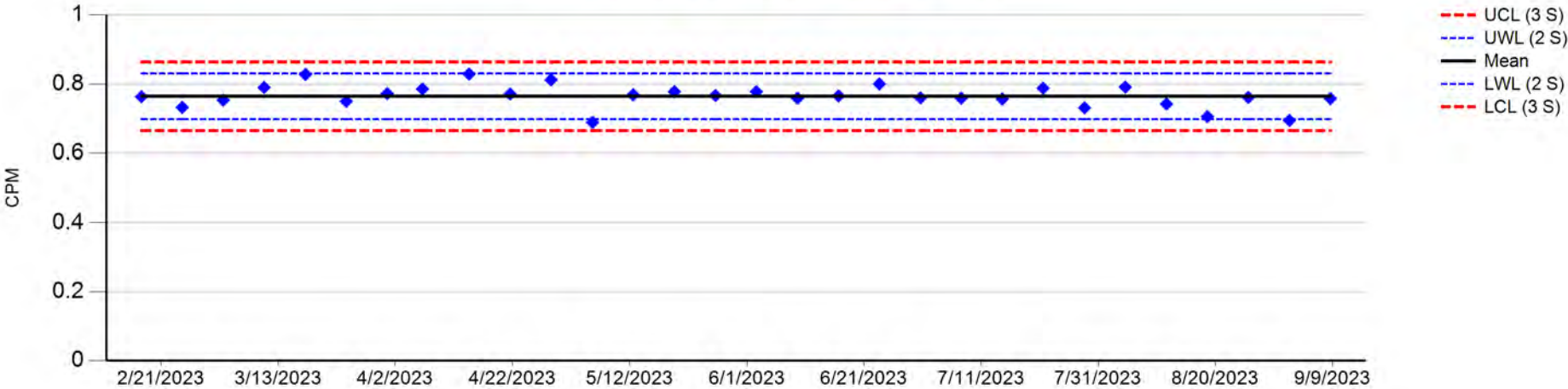
Bin	Frequency
0.7204	1
0.7222	4
0.7239	3
0.7257	7
0.7274	7
More	8

Population Frequency Distribution (Histogram)

Population Statistics				Trending Analysis	
Population Size	30	Date	9/8/2023	Most recent point outside of the 3-sigma values.	OK
Average	0.7646	CPM	0.7578	8 consecutive most recent points on one side of the mean.	OK
Standard Deviation	0.0331	Count Mins	900.00	2 of 3 most recent points above 2 sigma.	OK
+ 3-sigma value	0.8639	Date	9/1/2023	4 of 5 most recent points beyond the 1-sigma.	OK
- 3-sigma value	0.6652	CPM	0.6944	7 trending most recent points in a row.	OK
		Count Mins	900.00	15 most recent points inside 1 sigma.	OK
				8 most recent points outside 1 sigma.	OK

LB4200-D - BETA LONG BACKGROUND - DETECTOR B2

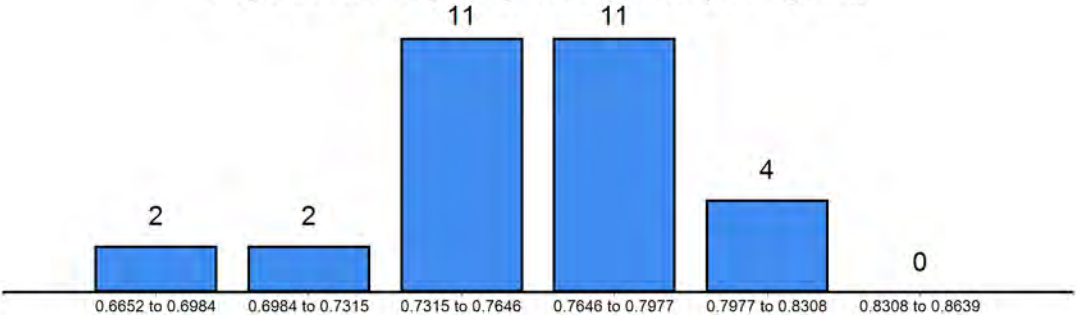
Process Date Range: 02/17/23 - 09/08/23



Statistical Process Control

Bin	Frequency
0.6652 to 0.6984	2
0.6984 to 0.7315	2
0.7315 to 0.7646	11
0.7646 to 0.7977	11
0.7977 to 0.8308	4
0.8308 to 0.8639	0

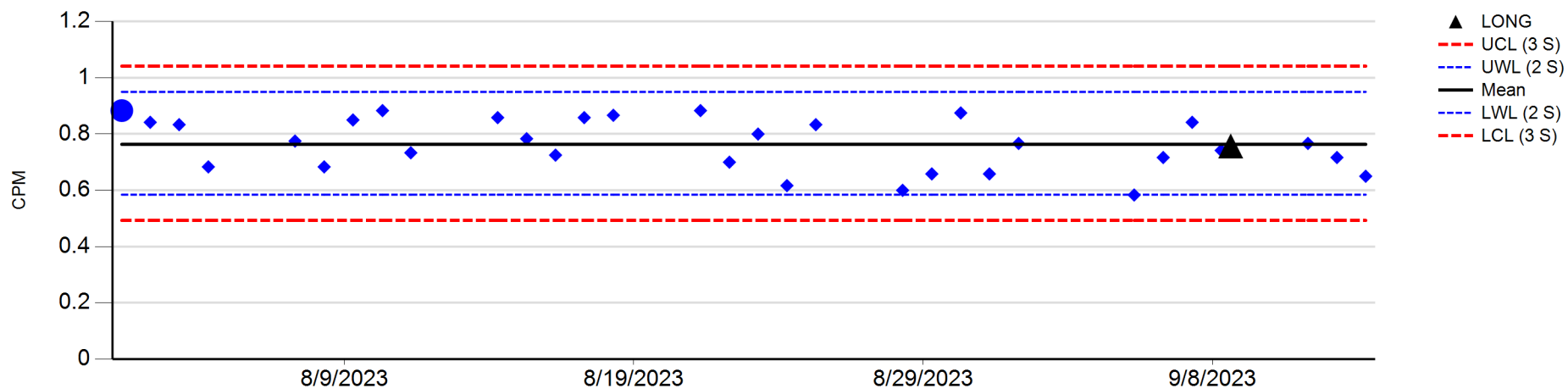
Population Frequency Distribution (Histogram)



Population Statistics		Trending Analysis			
Population Size	30	Long B Date	9/8/2023	Most recent point outside of the 3-sigma values.	OK
Average	0.7672	Long B CPM	0.7578	8 consecutive most recent points on one side of the mean.	OK
Standard Deviation	0.0914	Count Mins	900.00	2 of 3 most recent points above 2 sigma.	OK
+ 3-sigma value	1.0413	Date	9/12/2023	4 of 5 most recent points beyond the 1-sigma.	OK
- 3-sigma value	0.4931	CPM	0.7167	7 trending most recent points in a row.	OK
DER	0.4980	Count Mins	120.00	15 most recent points inside 1 sigma.	OK
DER Analysis	OK			8 most recent points outside 1 sigma.	OK

LB4200-D - BETA DAILY BACKGROUND - DETECTOR B2

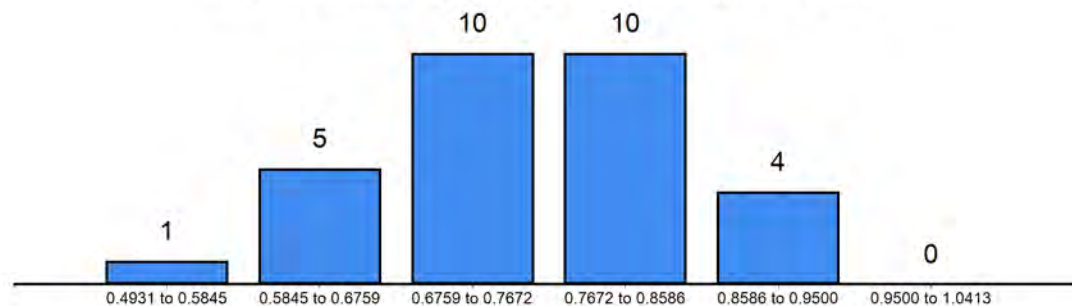
Process Date Range: 08/01/23 - 09/13/23



Statistical Process Control

ARS1-23-01973

Bin	Frequency
0.4931 to 0.5845	1
0.5845 to 0.6759	5
0.6759 to 0.7672	10
0.7672 to 0.8586	10
0.8586 to 0.9500	4
0.9500 to 1.0413	0

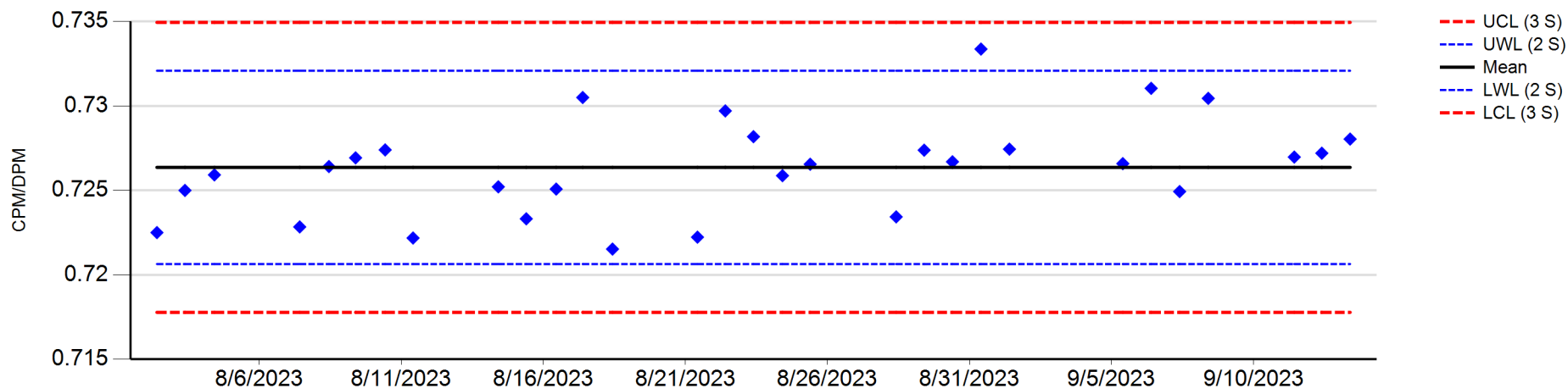
Population Frequency Distribution (Histogram)

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Population Statistics		Trending Analysis			
Population Size	30	Date	9/13/2023	Most recent point outside of the 3-sigma values.	OK
Average	0.7264	CPM/DPM	0.7280	8 consecutive most recent points on one side of the mean.	OK
Standard Deviation	0.0029			2 of 3 most recent points above 2 sigma.	OK
+ 3-sigma value	0.7349			4 of 5 most recent points beyond the 1-sigma.	OK
- 3-sigma value	0.7178			7 trending most recent points in a row.	OK
				15 most recent points inside 1 sigma.	OK
				8 most recent points outside 1 sigma.	OK

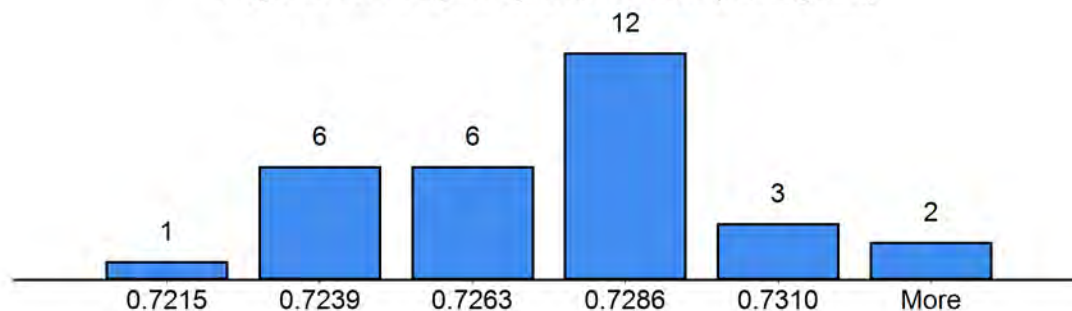
LB4200-D - BETA EFFICIENCY - DETECTOR B2

Process Date Range: 08/02/23 - 09/13/23



Statistical Process Control

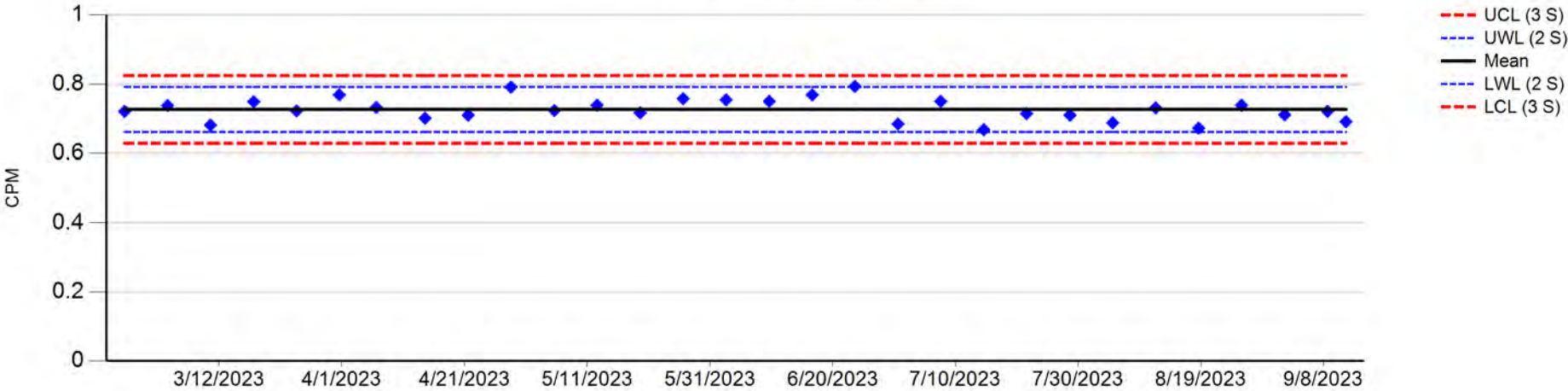
Bin	Frequency
0.7215	1
0.7239	6
0.7263	6
0.7286	12
0.7310	3
More	2

Population Frequency Distribution (Histogram)

Population Statistics		Trending Analysis			
Population Size	30	Date	9/11/2023	Most recent point outside of the 3-sigma values.	OK
Average	0.7266	CPM	0.6911	8 consecutive most recent points on one side of the mean.	OK
Standard Deviation	0.0326	Count Mins	900.00	2 of 3 most recent points above 2 sigma.	OK
+ 3-sigma value	0.8244	Date	9/8/2023	4 of 5 most recent points beyond the 1-sigma.	OK
- 3-sigma value	0.6288	CPM	0.7211	7 trending most recent points in a row.	OK
		Count Mins	900.00	15 most recent points inside 1 sigma.	OK
				8 most recent points outside 1 sigma.	OK

LB4200-D - BETA LONG BACKGROUND - DETECTOR B3

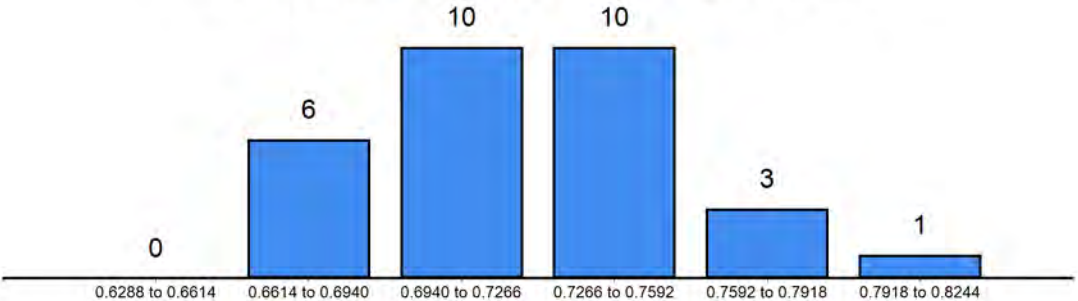
Process Date Range: 02/24/23 - 09/11/23



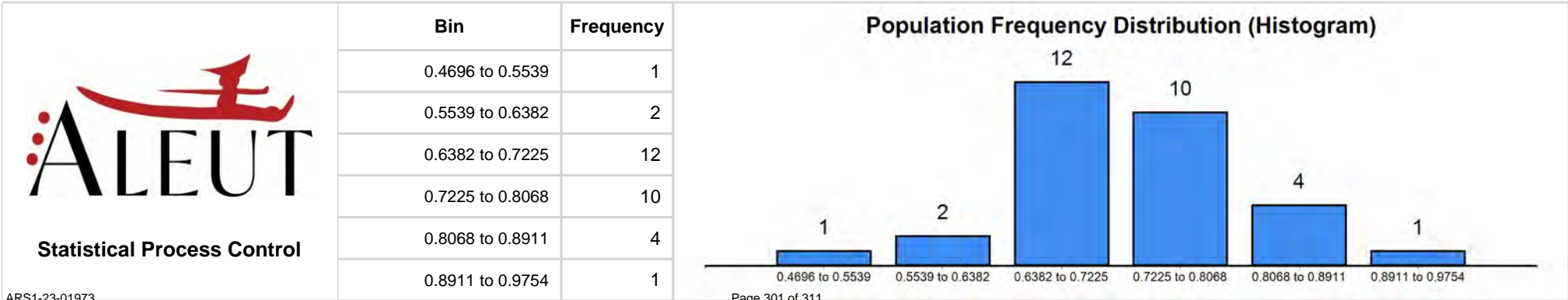
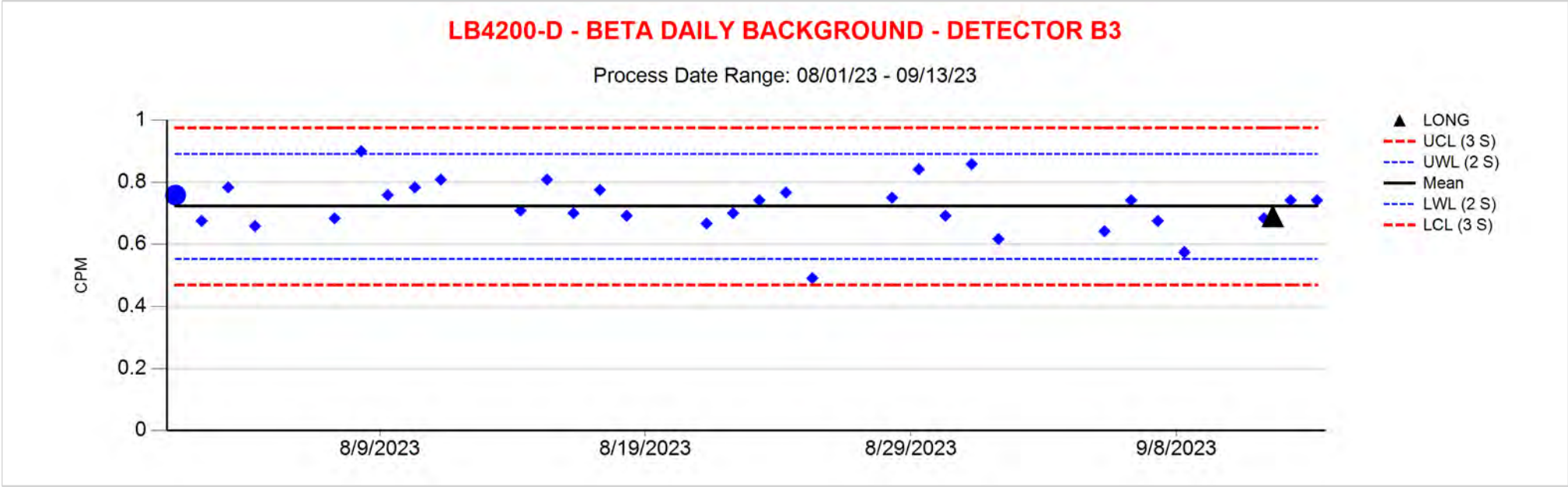
Statistical Process Control

Bin	Frequency
0.6288 to 0.6614	0
0.6614 to 0.6940	6
0.6940 to 0.7266	10
0.7266 to 0.7592	10
0.7592 to 0.7918	3
0.7918 to 0.8244	1

Population Frequency Distribution (Histogram)



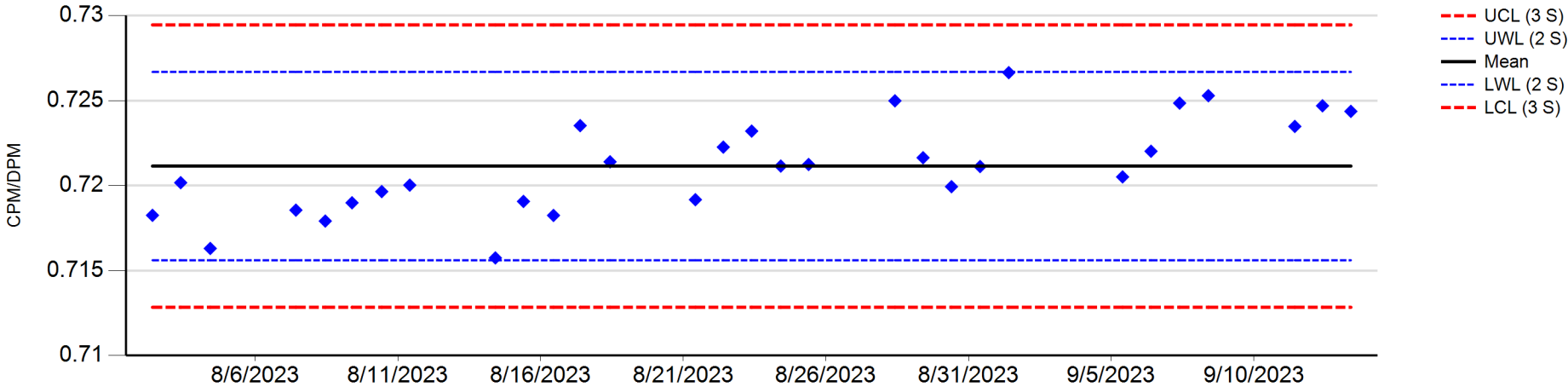
Population Statistics				Trending Analysis	
Population Size	30	Long B Date	9/11/2023	Most recent point outside of the 3-sigma values.	OK
Average	0.7225	Long B CPM	0.6911	8 consecutive most recent points on one side of the mean.	OK
Standard Deviation	0.0843	Count Mins	900.00	2 of 3 most recent points above 2 sigma.	OK
+ 3-sigma value	0.9754	Date	9/12/2023	4 of 5 most recent points beyond the 1-sigma.	OK
- 3-sigma value	0.4696	CPM	0.7417	7 trending most recent points in a row.	OK
DER	0.6065	Count Mins	120.00	15 most recent points inside 1 sigma.	OK
DER Analysis	OK			8 most recent points outside 1 sigma.	OK



Population Statistics		Trending Analysis			
Population Size	30	Date	9/13/2023	Most recent point outside of the 3-sigma values.	OK
Average	0.7211	CPM/DPM	0.7244	8 consecutive most recent points on one side of the mean.	OK
Standard Deviation	0.0028			2 of 3 most recent points above 2 sigma.	OK
+ 3-sigma value	0.7295			4 of 5 most recent points beyond the 1-sigma.	INVESTIGATE
- 3-sigma value	0.7128			7 trending most recent points in a row.	OK
				15 most recent points inside 1 sigma.	OK
				8 most recent points outside 1 sigma.	OK

LB4200-D - BETA EFFICIENCY - DETECTOR B3

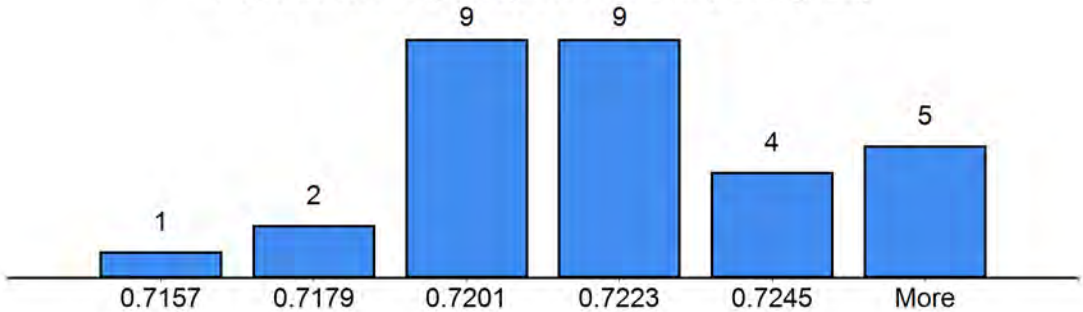
Process Date Range: 08/02/23 - 09/13/23



Statistical Process Control

Bin	Frequency
0.7157	1
0.7179	2
0.7201	9
0.7223	9
0.7245	4
More	5

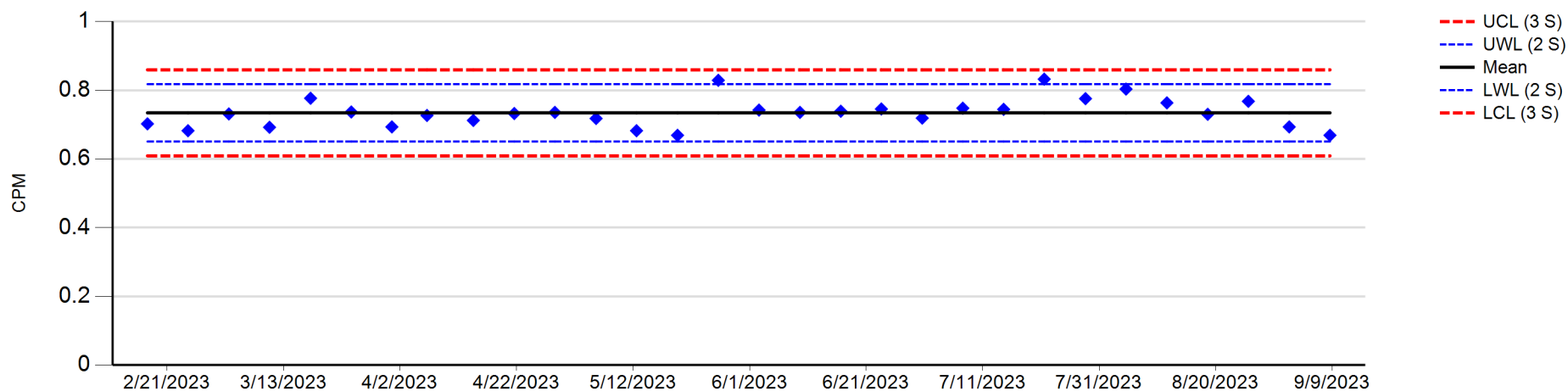
Population Frequency Distribution (Histogram)



Population Statistics		Trending Analysis			
Population Size	30	Date	9/8/2023	Most recent point outside of the 3-sigma values.	OK
Average	0.7342	CPM	0.6689	8 consecutive most recent points on one side of the mean.	OK
Standard Deviation	0.0417	Count Mins	900.00	2 of 3 most recent points above 2 sigma.	OK
+ 3-sigma value	0.8594	Date	9/1/2023	4 of 5 most recent points beyond the 1-sigma.	OK
- 3-sigma value	0.6090	CPM	0.6933	7 trending most recent points in a row.	OK
		Count Mins	900.00	15 most recent points inside 1 sigma.	OK
				8 most recent points outside 1 sigma.	OK

LB4200-D - BETA LONG BACKGROUND - DETECTOR B4

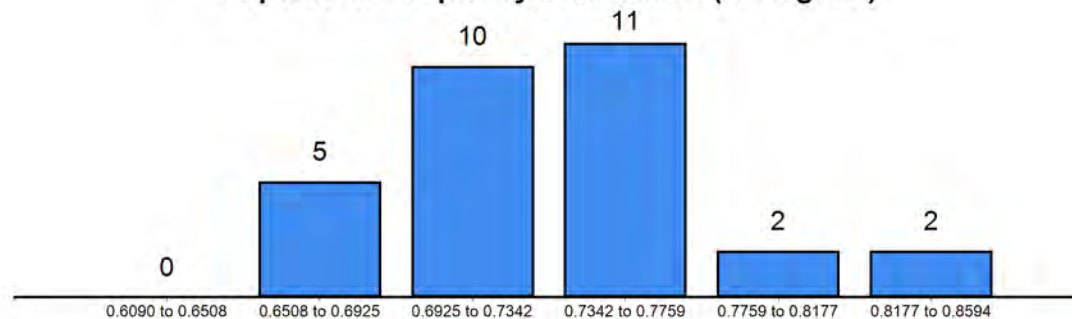
Process Date Range: 02/17/23 - 09/08/23



Statistical Process Control

ARS1-23-01973

Bin	Frequency
0.6090 to 0.6508	0
0.6508 to 0.6925	5
0.6925 to 0.7342	10
0.7342 to 0.7759	11
0.7759 to 0.8177	2
0.8177 to 0.8594	2

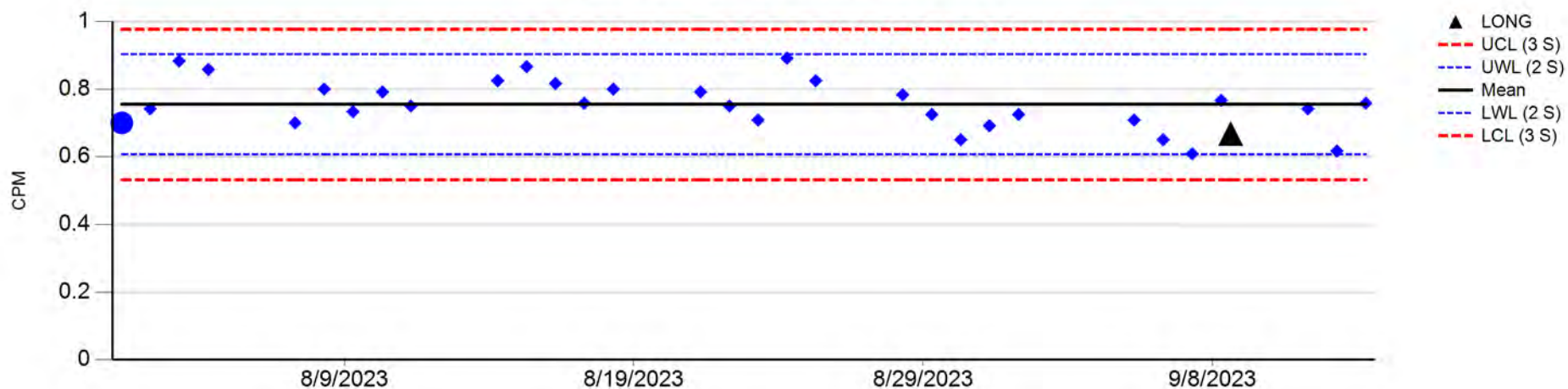
Population Frequency Distribution (Histogram)

Page 303 of 311

Population Statistics		Trending Analysis			
Population Size	30	Long B Date	9/8/2023	Most recent point outside of the 3-sigma values.	OK
Average	0.7553	Long B CPM	0.6689	8 consecutive most recent points on one side of the mean.	OK
Standard Deviation	0.0741	Count Mins	900.00	2 of 3 most recent points above 2 sigma.	OK
+ 3-sigma value	0.9777	Date	9/12/2023	4 of 5 most recent points beyond the 1-sigma.	OK
- 3-sigma value	0.5329	CPM	0.6167	7 trending most recent points in a row.	OK
DER	0.6809	Count Mins	120.00	15 most recent points inside 1 sigma.	OK
DER Analysis	OK			8 most recent points outside 1 sigma.	OK

LB4200-D - BETA DAILY BACKGROUND - DETECTOR B4

Process Date Range: 08/01/23 - 09/13/23

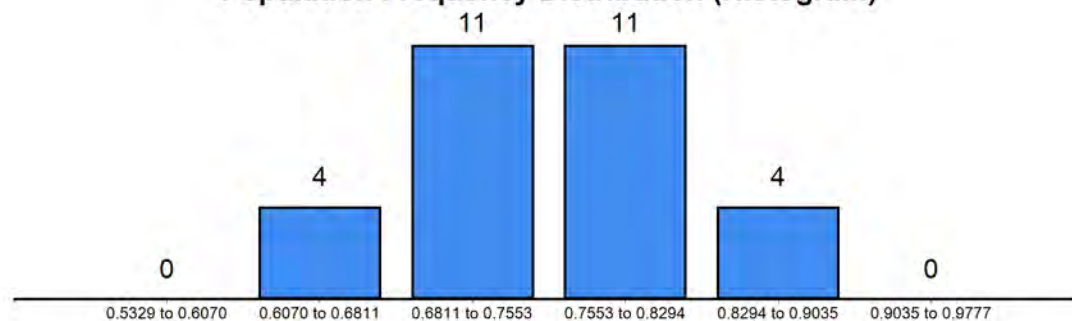


Statistical Process Control

ARS1-23-01973

Bin	Frequency
0.5329 to 0.6070	0
0.6070 to 0.6811	4
0.6811 to 0.7553	11
0.7553 to 0.8294	11
0.8294 to 0.9035	4
0.9035 to 0.9777	0

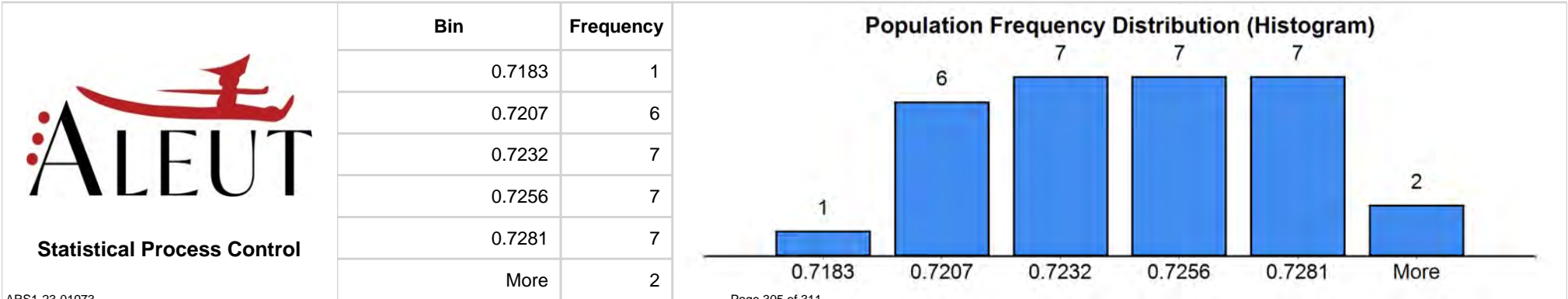
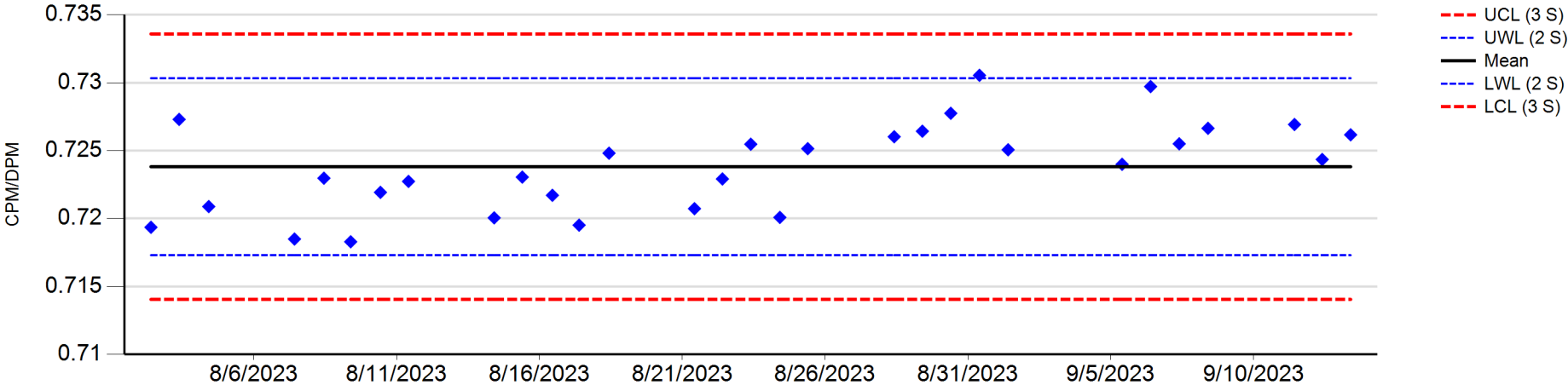
Population Frequency Distribution (Histogram)



Population Statistics			Trending Analysis		
Population Size	30	Date	9/13/2023	Most recent point outside of the 3-sigma values.	OK
Average	0.7238	CPM/DPM	0.7262	8 consecutive most recent points on one side of the mean.	INVESTIGATE
Standard Deviation	0.0033			2 of 3 most recent points above 2 sigma.	OK
+ 3-sigma value	0.7336			4 of 5 most recent points beyond the 1-sigma.	OK
- 3-sigma value	0.7140			7 trending most recent points in a row.	OK
				15 most recent points inside 1 sigma.	OK
				8 most recent points outside 1 sigma.	OK

LB4200-D - BETA EFFICIENCY - DETECTOR B4

Process Date Range: 08/02/23 - 09/13/23





ARS Aleut Analytical, LLC Analytical Reports

for

GES-AIS, LLC

Technical Review Checklists



Project Manager Report Checklist

Data Package: ARS1-23-01973

Client: GES-AIS, LLC

Report Compilation Checklist:	Review
COMPONENTS: Stage 1	
Title Page and Cover Sheet	Yes
Table Of Contents	Yes
Case Narrative (including Correspondence/Notes Page)	Yes
Form 1s (including all Samples and Tests)	Yes
Sample Receipt Records (COC/SDG/DQO/Survey/Shipping)	Yes
COMPONENTS: Stage 2	
All Stage 1 Components	Yes
A) QC Results (including All Tests)	Yes
B) Instrument QC Forms	Yes
B) Instrument Runlong/Preparation Logs	Yes
COMPONENTS: Stage 3	
All Stage 2A/B Components	Yes
Instrument Quantitation Reports and Raw Data	Yes
LIMS Generated Reports	Yes
Standards Tracability	Yes
COMPONENTS: Stage 4	
All Stage 3 Components	Yes
RAD Instrument Data (Eff/Cal/Back/Spec/Control Charts)	Yes
Chemistry Data (Cal/CVV/Spectrums)	N/A
Technical Review Checklists	Yes

AHOOVER

Primary Reviewer

10/2/2023 11:21

Date

SLEESE

Secondary Reviewer

10/2/2023 12:03

Date

Comments:

No comments were added to this technical review.

SDG Comments:

Priority sample per email.



GPC Technical Review Checklist

SDG:	ARS1-23-01973	Batch:	ARS1-B23-01624 (GPC-SR90-SO)
Aliquot:	<input checked="" type="radio"/> Dry <input type="radio"/> As Received <input type="radio"/> Filtered <input type="radio"/> Other: _____		
QC Samples:	<input checked="" type="checkbox"/> Blank <input checked="" type="checkbox"/> LCS <input checked="" type="checkbox"/> LCSD <input checked="" type="checkbox"/> Sample Dup <input type="checkbox"/> MS <input type="checkbox"/> MSD		

Sample Preparation Review:	Primary Review	Secondary Review
100% of manual transcriptions verified?	Yes	Yes
QC and samples are aliquoted / traced?	Yes	Yes
QC (LCS and LCSD) samples are present and match ID to batch ID	Yes	Yes
Tracer Recorded / Carrier Recorded correct standard	Yes	Yes
Gravimetric Yield is within acceptance limits?	Yes	Yes
Deviations from procedure are documented and verified?	N/A	N/A
Preparation anomaly?	No	N/A

DWILLIAMS

9/13/2023 11:04

SWALDROP

9/13/2023 11:09

Primary Reviewer

Date

Secondary Reviewer

Date

Sample Analysis Review:	Primary Review	Secondary Review
Calibrations/Backgrounds valid and current?	Yes	Yes
Source Checks completed and acceptable?	Yes	Yes
Background Checks completed and acceptable?	Yes	Yes
100% of manually entered parameters verified accurate?	Yes	Yes
Appropriate QC samples initiated at required frequency?	Yes	Yes
Test/Sample specific parameters (See ARS-059 for details)		
Physical configuration of sample equivalent to calibration?	Yes	Yes
Analysis anomaly?	No	N/A

SWALDROP

9/13/2023 13:37

BSTEFFENS

9/19/2023 12:04

Primary Reviewer

Date

Secondary Reviewer

Date



GPC Technical Review Checklist

Project Management and Laboratory Management Review:	Primary Review	Secondary Review
RDL criteria met?	Yes	Yes
Activity + 3xCSU a negative number?	No	No
Method Blank criteria met?	Yes	Yes
LCS/LCSD criteria met?	Yes	Yes
Duplicate (DUP, LCSD, MSD) criteria met?	Yes	Yes
MS/MSD criteria met?	N/A	N/A
Chemical yield results meet acceptance criteria?	Yes	Yes
Batch QC anomaly?	No	N/A

AHOOVER

10/2/2023 11:20

SLEESE

10/2/2023 12:03

Primary Reviewer

Date

Secondary Reviewer

Date

Comments:

No comments were added to this technical review.

Technical Notes:

No tech notes were entered.



Gamma Spec Technical Review Checklist

SDG:	ARS1-23-01973	Batch:	ARS1-B23-01775 (GAM-IG21-SO)
Aliquot:	<input checked="" type="radio"/> Dry <input type="radio"/> As Received <input type="radio"/> Filtered <input type="radio"/> Other: _____		
QC Samples:	<input checked="" type="checkbox"/> Blank <input checked="" type="checkbox"/> LCS <input checked="" type="checkbox"/> LCSD <input checked="" type="checkbox"/> Sample Dup <input type="checkbox"/> MS <input type="checkbox"/> MSD		

Sample Preparation and Analysis Review:	Primary Review	Secondary Review
Sample Prep anomaly?	No	N/A
Prepped sample homogeneity acceptable?	Yes	N/A
Physical integrity of equipment verified?	Yes	N/A
Cleanliness of equipment verified?	Yes	N/A
Test/Sample specific parameters (See ARS-059 for details)		
Calibration applied matches sample geometry?	Yes	Yes
Nuclide Identification Report correlates within expected ranges?	Yes	Yes
FWHM / Peak Activity Correlation is satisfactory?	Yes	Yes
Library Identified Peaks are correctly identified?	Yes	Yes
Spectral Anomalies addressed & appropriate action taken?	N/A	N/A
Peak Background Correction is activated?	Yes	Yes
Calibrations/Backgrounds valid and current?	Yes	Yes
Source Checks completed and acceptable?	Yes	Yes
Background Checks completed and acceptable?	Yes	Yes
Sample IDs correspond to LIMS SDG information?	Yes	Yes
100% of manual transcriptions verified?	Yes	Yes
Sample prepped in valid geometry? (Sample Prep Information)	Yes	Yes
Prepped sample density acceptable?	Yes	Yes
Appropriate QC samples initiated at required frequency?	Yes	Yes
100% of manually entered parameters verified accurate?	Yes	Yes
Analysis anomaly?	No	N/A

SWALDROP

10/2/2023 08:05

BSTEFFENS

10/2/2023 10:39

Primary Reviewer

Date

Secondary Reviewer

Date



Gamma Spec Technical Review Checklist

Project Management and Laboratory Management Review:	Primary Review	Secondary Review
RDL criteria met?	Yes	Yes
Activity + 3xCSU a negative number?	No	No
Method Blank criteria met?	Yes	Yes
LCS/LCSD criteria met?	Yes	Yes
Duplicate (DUP, LCSD) criteria met?	Yes	Yes
Batch QC anomaly?	No	N/A

AHOOVER

10/2/2023 11:21

SLEESE

10/2/2023 12:03

Primary Reviewer

Date

Secondary Reviewer

Date

Comments:

No comments were added to this technical review.

Technical Notes:

No tech notes were entered.

FINAL SUMMARY REPORT, RADIOLOGICAL OBJECT RECOVERY
PARCEL C RADIOLOGICAL CONFIRMATION SAMPLING AND SURVEY
HUNTERS POINT NAVAL SHPYARD, SAN FRANCISCO CA

APPENDIX B

HPNS PARCEL C FACT SHEET

FINAL SUMMARY REPORT, RADIOLOGICAL OBJECT RECOVERY
PARCEL C RADIOLOGICAL CONFIRMATION SAMPLING AND SURVEY
HUNTERS POINT NAVAL SHPYARD, SAN FRANCISCO CA

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FACT SHEET

Hunters Point Naval Shipyard

Parcel C Radiological Deck Marker Recovery

September 2023



This fact sheet discusses information about the recent recovery of a deck marker in a secured area on Parcel C at Hunters Point Naval Shipyard (HPNS).

Radiological Retesting at HPNS

In late 2017, Navy completed an evaluation of past radiological data in identified areas at HPNS and determined this data to be unreliable. Since 2020, the Navy has been collecting new radiological data in those identified areas to ensure cleanup is protective of public health and the environment. The data includes soil samples from trench excavations, soil borings, and former building areas. Retesting fieldwork at Parcel C began in August 2022 and is ongoing. To date, 40% of the planned trenches in Parcel C have been excavated and sampled.

Recovery at Parcel C

On August 24, 2023, a reading was detected during a routine scan conducted of excavated material from trench unit (TU) - 315 at Parcel C. A mobile radiation detection system identified the reading in excavated soil from TU-315 on a radiological screening yard (RSY) pad in a secure area. In compliance with established work plans, the location was marked off for further investigation.

How was the deck marker found?

Upon further investigation, a historical deck marker, approximately 1.5-inches in diameter, was found intact 2-inches below the surface in loose soil on the RSY pad. Surrounding soil samples were taken for further analysis. Static gamma counts and dose-rate readings were collected before the item was bagged,

labeled, and placed in a lead-lined safe inside a secure, on-site trailer.

Is the community at risk?

No. Parcel C is not accessible to the public. The deck marker was found in a radiologically-controlled area within a secure, active cleanup site at HPNS and does not pose a risk to members of the community. The Navy's health and safety protocols ensured worker safety during recovery and removal of the deck marker.

The relative dose of radiation from the deck marker is low, at 1.9 millirem annually if a person were to sit or lay down on top of the location for 8 hours per day for 1 year. This annual exposure is roughly equivalent to a single six-hour flight from New York to California.

How can you get answers to your radiological health and safety questions?

Dr. Kathryn Higley is an internationally recognized expert in radiological health and safety. She is a resource to the community for radiological health and safety information, especially as it relates to HPNS.

Members of the community may contact Dr. Higley directly by phone (541-737-0675) or email (kathryn.higley@oregonstate.edu). She is also available during scheduled office hours (scan the QR code to register).

This image shows the location where the deck marker was identified before it was removed. It is located on an RSY pad within a restricted area.



Scan the
QR code for
HPNS resources.



- Join the mailing list
- Link to the Navy website
- Register for guided bus tours
- Sign up for Technical Advisor office hours



September 2023

FINAL SUMMARY REPORT, RADIOLOGICAL OBJECT RECOVERY
PARCEL C RADIOLOGICAL CONFIRMATION SAMPLING AND SURVEY
HUNTERS POINT NAVAL SHPYARD, SAN FRANCISCO CA

APPENDIX C
HPNS PARCEL C PHASE I DAILY PRODUCTION REPORT FOR
08.24.23 - GES REPORT

FINAL SUMMARY REPORT, RADIOLOGICAL OBJECT RECOVERY
PARCEL C RADIOLOGICAL CONFIRMATION SAMPLING AND SURVEY
HUNTERS POINT NAVAL SHPYARD, SAN FRANCISCO CA

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DAILY PRODUCTION REPORT

(Attach Continuation Page as Needed)

Project	CONTRACT NO. / TO NO.		PROJECT TITLE / LOCATION				REPORT DATE	REPORT NO.
	N62473-17-D-0005		Parcel C				24-Aug-23	150
	GES Project No.	J31000.600	Hunters Point Naval Shipyard, San Francisco, CA					

Weather	Weather Conditions				Temp (F)		Ground Conditions	
	AM	Partly cloudy	PM	Partly Sunny	Low	63	Dry	
					High	86		
Additional Comments 23 MPH max wind today.								

GES Personnel On Site	Scheduled Activity No.	GES Staff Name	Trade/Duty Position	Number	Description of Work Performed	Hrs
		Henery Ng	Project Engineer	1	Project oversight	5.00
		Federico DeLeon	Laborer	1	Laborer	10.00
		Mohammad-Qasim Pacha	QC Manager	1	Quality Control	5.00
		Tony Olmstead	Senior Superintendent	1	Project management/Alt QC/Alt H&S	0.00
		Randy Jackson	Site Superintendent	1	Project superintendent	5.00
		Charles Halvorson	Laborer/ Operator	1	Laborer/ Operator	0.00
		Giovanny Alfaro	Operator / supervisor	1	Oversight / superintendent	0.00
		Kim Tom	Air monitoring	1	Air equipment	10.00
		Mike Chindavong	Air monitoring	1	Air equipment	10.00
		Erick Gutierrez	Laborer	1	Laborer	0.00
		Frankie Hernandez	Laborer	1	Laborer/ Operator	0.00
		Andre Galloway	Laborer	1	Laborer	0.00
		Dusty Herteman	Operator	1	Operator	10.00
		Chanthachone Alexander	H&S	1	Health and safety oversight	5.00
		Zach McFarland	Labor	1	Labor	10.00
		Mark Henry	Operator	1	Equipment Operator	10.00
		Teresah Ruha	Site Geologist	1	Site geologist	0.00
		Harry Obregon	Labor	1	Labor	0.00
		Logan Schwing	Air monitoring	1	Air equipment	5.00
	Andy Alexander	Radiation Manager	1	Radiological Support	5.00	

Subcontractor Personnel On Site	Scheduled Activity No.	Employer	Trade/Duty/Position	Number	Description of Work Performed	Hrs.
		Envirachem	Chris Bryson/RSO	1	Radiological support/RSO	5.00
		Envirachem	James Vorasane/Rad Tech	1	Radiological support	5.00
		Envirachem	Buress Swayze/RSO	1	Radiological support/RSO	5.00
		Envirachem	Danny Bullian/Rad Tech	1	Radiological support	5.00
		Envirachem	Jaime Pena/Rad Tech	1	Radiological support	10.00
		Envirachem	Paul Dannenberg/Rad Tech	1	Radiological support	0.00
		Envirachem	Kenny Enabenter/ Rad Tech	1	Radiological support	0.00
		Lawson Trucking	Henry Lawson/Driver	1	Dump truck driver	10.00
		Lawson Trucking	Maurice Wysinger/Driver	1	Dump truck driver	0.00
		Lawson Trucking	Kevin Lawson/Driver	1	Water Truck driver	0.00
		Envirachem	Rhys Davidson	1	Radiological support	0.00
		Envirachem	Journey Coughman	1	Radiological support	5.00
		Envirachem	Trever Rizzo	1	Radiological support	0.00
		Envirachem	Devin Lewis	1	Radiological support	10.00
		Envirachem	Ray Blaine	1	Radiological support	0.00
Total Gilbane Work-Hours on Site This Day					90.00	
Total Subcontractor Work-Hours on Site This Day					55.00	
Subtotal Gilbane + Subcontractor Work-Hours on Site This Day					145.00	
Cumulative Total Work-Hours From Previous Report					17544.00	
Cumulative Work-Hours from Start of Construction					17689.00	

55

**DAILY PRODUCTION REPORT**

(Attach Continuation Page as Needed)

Project	CONTRACT NO. / TO NO.		PROJECT TITLE / LOCATION	REPORT DATE	REPORT NO.
	N62473-17-D-0005		Parcel C	24-Aug-23	150
	GES Project No.	J31000.600	Hunters Point Naval Shipyard, San Francisco, CA		


Safety	Was a job safety meeting held this date? (If "yes," attach copy of meeting minutes.)	No		Yes	X
	Were there any lost time accidents this date? (If "yes" attach copy of completed OSHA report)	No	X	Yes	
	Was Crane/Man lift/Scaffolding/HV Elec/High Work/Hazmat work done? (If "yes" attach statement or checklist showing inspection performed.)	No		Yes	X
	Was hazardous material/waste released into the environment? (If "yes" attach description of incident and proposed action)	No	X	Yes	
	Description of Health & Safety Actions Taken Today / Safety Inspections Conducted Safety tailgate meeting, see log.				

Equipment	Equipment/material received today to be used on job site:
	Genie 45' man lift from JRM rentals.
	Construction and field equipment on job site today (include field instruments): 525 gallon water trailer, two cat skid steers, 335 CAT excavator, 308 Cat excavator, 2 dump trucks, Topcon GPS system, 2 out houses, Volvo wheel loader. Genie 45' man lift from JRM rentals.

Work Performed Today	Description of work performed today:
	<ul style="list-style-type: none"> - Safety Tailgate with all personnel building 400. - Maintaining BMP's. - TU-238, 0 loads 0 +/- yard of ESU, 3 loads 25 +/- yards of SFU were placed in the RSY laydown area. - ESU TU-315 pad area drive-over with RSI 700 was started from the east side. - Excavation was stopped early due to issues with GPS equipment. The trenches are surrounded by tall buildings, so therefore we are having ongoing issues connecting to the satellites. After troubleshooting for a while, we stop to give us enough time to put all the equipment away for the weekend.

Work Planned Next Day	Description of work planned for next working day or next working week:
	Continue RSY pad construction. Continue excavation TU-238. Drive-over with RSI 700.

Issues or Concerns	Discussion of issues / concerns encountered on site:
	Today a Radiological object was found on TU-315 ESU during drive-over with RSI 700, Envirachem RSO,s and GES team removed the found item with Battelle and navy oversight.

Visitors	Name	Organization	Purpose of Visit
	Basi Basi	ROICC	Navy oversight
	Hamid Naime	ROICC	Navy oversight
	Minh Chi	Battelle	oversight
Signed	Gilbane Superintendent Signature:		
	Printed Name and Title:	Randy Jackson Superintendent	
		Date: 24-Aug-23	


NOTE: ATTACH PERTINENT INFORMATION TO THIS REPORT.




DAILY PRODUCTION REPORT PHOTO LOG

PROJECT	Project No./Contract No.	Project Title / Location	Day of Report	Report No.
	N62473-17-D-0005	Parcel C Removal Site Evaluation work plan	24-Aug-23	150
	PROJECT NO. J31000.600	Hunters Point Naval Shipyard, San Francisco, CA		


1	2
DAILY PHOTOS	
3	4
DAILY PHOTOS	
3	4
DAILY PHOTOS	



GES checking points with GPS, TU-238.



GES and Envirachem setting up for removal of item from RSY pad.



Envirachem RSO labling bag with item for placement in storage after removal from RSY ESU from TU-315.

FINAL SUMMARY REPORT, RADIOLOGICAL OBJECT RECOVERY
PARCEL C RADIOLOGICAL CONFIRMATION SAMPLING AND SURVEY
HUNTERS POINT NAVAL SHPYARD, SAN FRANCISCO CA

APPENDIX D
HPNS PARCEL C RADIOLOGICAL HPNS 3rd PARTY QA REPORT
08.24.23

FINAL SUMMARY REPORT, RADIOLOGICAL OBJECT RECOVERY
PARCEL C RADIOLOGICAL CONFIRMATION SAMPLING AND SURVEY
HUNTERS POINT NAVAL SHPYARD, SAN FRANCISCO CA

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Quality Assurance Surveillance Report

Surveillance Checklist Number(s) HPNS-QAS-2023-0162 Surveillance Date 8/24/2023

Surveillance Report Number HPNS-QAR-2023-0162 Surveillance Report Generation Date 8/24/2023

Number of Surveillance Photographs Taken 10

Describe the work event, contractor, site location, date and weather:

This surveillance observed a LLRO extraction performed by GES. Approximately 20 minutes of GES staff time was taken to accommodate this surveillance. The weather was 77 °F and sunny.

Describe what was observed:

The Battelle QA team arrived at Parcel C to observe extraction of an LLRO identified during a RS-700 drive-over survey performed on RSY Pad ESU TU-315A with the soil originating from Phase I TU-315. The area was delineated (Figure 1). Prior to extracting the LLRO, an RCT performed a gamma static measurement on contact and at 30 cm away from the LLRO location (Figure 2). The RCT also performed an exposure rate survey at the same distances (Figure 3). The LLRO location was then carefully excavated with a shovel and the soil was placed on plastic sheeting to find the LLRO (Figure 4). The LLRO identified appeared to be a disc shaped deck marker measuring approximately 2 inches in diameter (Figure 5). A gamma scan was conducted around the area where the LLRO was discovered; no elevated activity was identified. Another RCT then performed a gamma static measurement and exposure rate both on contact and at 30 cm of the LLRO (Figures 6 and 7). The Ludlum 2221 w/44-10 and Ludlum Model 19 instruments were used within the calibration window (Figures 8 and 9). The LLRO was then double bagged with the survey information written on the outer Ziploc bag (Figure 10).

All observed aspects of GES radioactive material handling were in compliance with all approved work documentation.

Describe any contractor deficient conditions observed with reference:

None.

Recommendations, Process Improvements, or Suggestions:

None.

Battelle Project Signatories

X 

Minhsec Chi
Battelle QA Radiation Safety Specialist

Surveillance Photographs HPNS-QAR-2023-0162



Figure 1 – LLRO area was isolated with orange delineators



Figure 2 – Gamma static measurement performed on contact of the soil surface

Surveillance Photographs HPNS-QAR-2023-0162 (Continued)



Figure 3 – Exposure rate measurement 30 cm away from the LLRO location



Figure 4 – GES employee extracting the LLRO and soil with a shovel

Surveillance Photographs HPNS-QAR-2023-0162 (Continued)



Figure 5 – A 2-inch disc shape deck marker was identified from the extraction



Figure 6 – Gamma static measurement performed on contact of the LLRO

Surveillance Photographs HPNS-QAR-2023-0162 (Continued)



Figure 7 – Exposure rate measurement performed 30 cm away from the LLRO

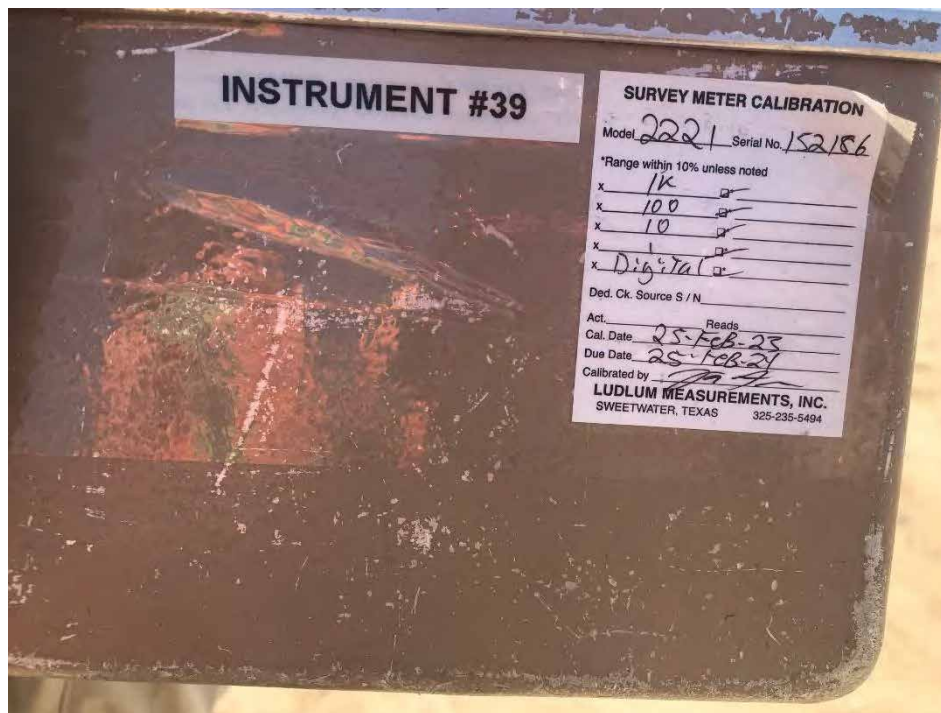


Figure 8 – Ludlum 2221, serial #152186, calibration due date 2/25/2024

Surveillance Photographs HPNS-QAR-2023-0162 (Continued)

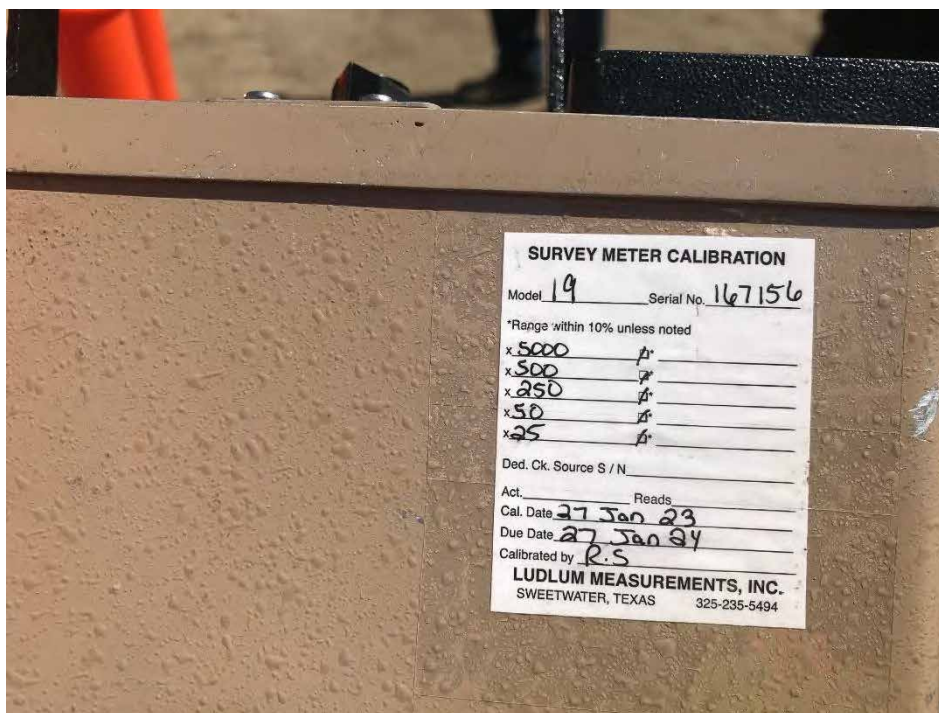


Figure 9 – Ludlum Model 19, serial #167156, calibration due date 1/27/2024

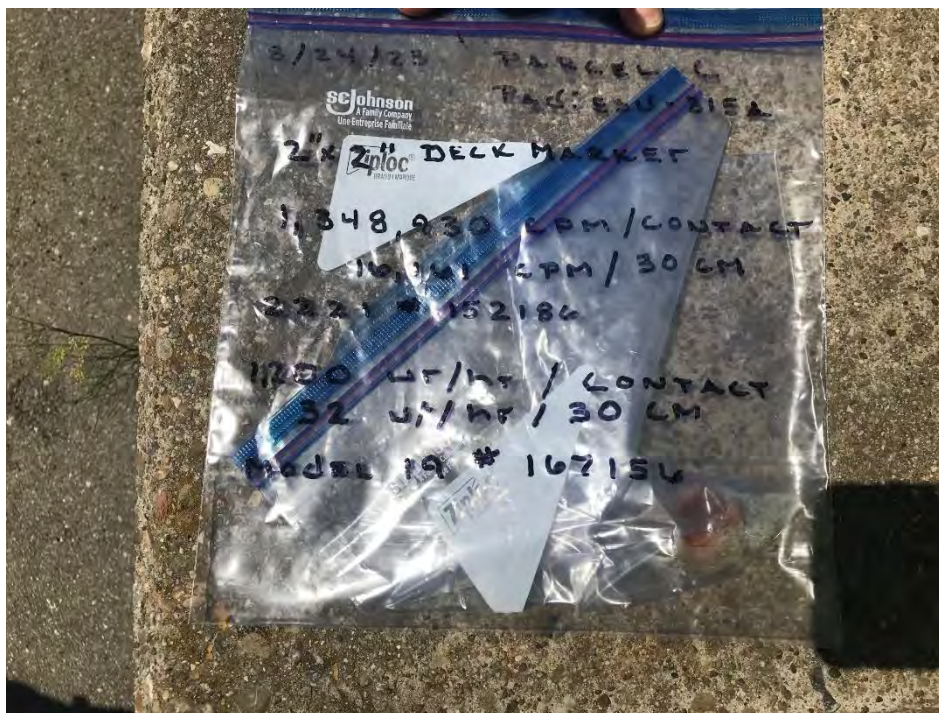


Figure 10 – LLRO was double bagged with survey information written on the outer Ziploc bag

FINAL SUMMARY REPORT, RADIOLOGICAL OBJECT RECOVERY
PARCEL C RADIOLOGICAL CONFIRMATION SAMPLING AND SURVEY
HUNTERS POINT NAVAL SHPYARD, SAN FRANCISCO CA

APPENDIX E
HPNS PARCEL C RADIOLOGICAL INVESTIGATION AND SURVEY –
ROICC DAILY REPORT 08.24.23

FINAL SUMMARY REPORT, RADIOLOGICAL OBJECT RECOVERY
PARCEL C RADIOLOGICAL CONFIRMATION SAMPLING AND SURVEY
HUNTERS POINT NAVAL SHPYARD, SAN FRANCISCO CA

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ROICC QUALITY ASSURANCE (QA) REPORT						DATE		8/24/2023	
CONTRACT NO: N62473-17-D-0005 CTO No: N6247318F5305		TITLE AND LOCATION Hunters Point Parcel C Removal site Evaluation				CONTRACTOR		Gilbane (GES)	
Status	WORKING?	YES	NO	IF NO, WHY NOT: _____					
		<input checked="" type="checkbox"/>	<input type="checkbox"/>						
	WEATHER CONDITIONS:		AM: Sunny PM: Sunny High 74°F, Low 63°F						
Check Points				YES	NO	REMARKS (REQUIRED FIELD):			
	SUPERINTENDENT ON SITE			<input checked="" type="checkbox"/>	<input type="checkbox"/>	Randy Jackson			
	QC MANAGER ON SITE			<input checked="" type="checkbox"/>	<input type="checkbox"/>	Mohammad Qasim Pacha			
	NAVY QASP CURRENT			<input checked="" type="checkbox"/>	<input type="checkbox"/>				
	CONTRACTOR QC REPORTS CURRENT			<input checked="" type="checkbox"/>	<input type="checkbox"/>	Contractor will submit QC report for today.			
	DUST / AIR MONITORING COMPLIANT			<input checked="" type="checkbox"/>	<input type="checkbox"/>	Upwind and downwind air monitoring stations are operating during site work.			
	DEFICIENCY LIST REVIEWED			<input type="checkbox"/>	<input checked="" type="checkbox"/>	No deficiency observed during the site visit			
WORK OBSERVED/DEFICIENCIES NOTED/SAFETY ISSUES DISCUSSED/QA TESTS AND RESULTS:									
Schedule Activity No	DESCRIBE OBSERVATIONS								
1	A quality assurance (QA) site visit was conducted at Gilbane (GES) job site for the Parcel C Radiological Investigation survey. No deficiencies were observed during the site visit.								
2	Continued removal and radiological scanning of asphalt cover of TU-238.								
3	Continued excavation of TU-238.								
4	Gamma drive over survey of RSY pad TU-315A-ESU was observed.								
5	Continued preparation of placed soil in RSY pads for radiological process.								
6	During the Gamma drive over survey a radiological object (Deck Marker) has been found on RSY pad TU-315A ESU. The soil of this RSY pad excavated from TU-315.The object was remove properly.								
MEETING/CONFERENCE NOTES (INCLUDING PARTICIPANTS):									
	No safety or QA issues were observed.								
INSTRUCTIONS GIVEN OR RECEIVED/CONTROVERSIES PENDING:									
Schedule Activity No.	INSTRUCTIONS/CONTROVERSIES								
Hamid Naimi QA / ROICC REPRESENTATIVE									
8-24-2023 DATE									
SUPV INITIALS DATE									

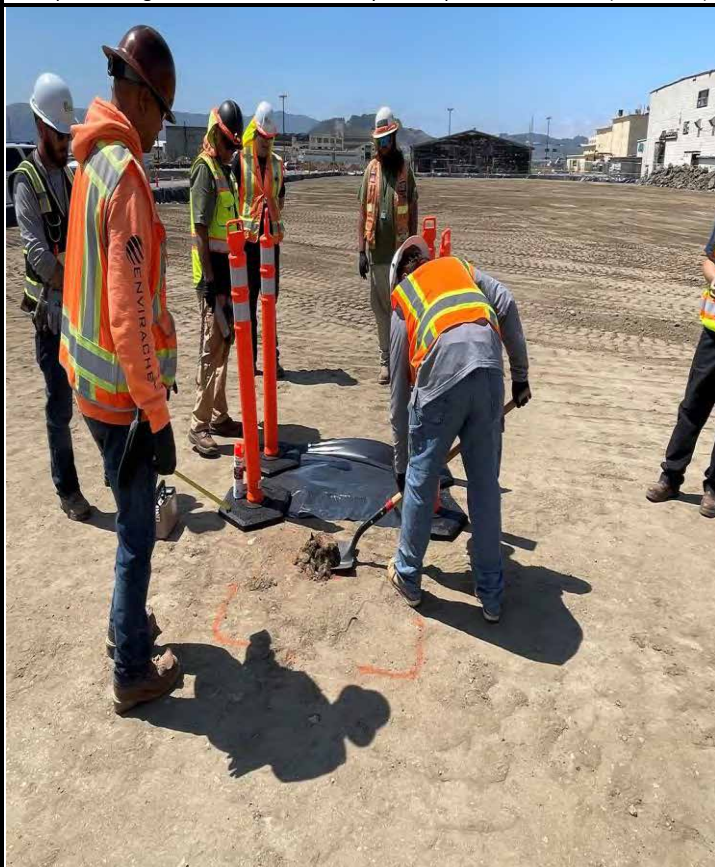
Project Site Pictures



RCT performing Gamma drive over survey of RSY pad TU-315A-ESU. (8-24-2023)



Excavation of TU-238. (8-24-2023)



RCT removing the radiological object of RSY pad TU-315 ESU. (8-24-2023)



Removed radiological object from RSY pad TU-315-ESU. (8-24-2023)

FINAL SUMMARY REPORT, RADIOLOGICAL OBJECT RECOVERY
PARCEL C RADIOLOGICAL CONFIRMATION SAMPLING AND SURVEY
HUNTERS POINT NAVAL SHPYARD, SAN FRANCISCO CA

APPENDIX F

HPNS PARCEL C RADIOLOGICAL OBJECT LABORATORY RESULTS

FINAL SUMMARY REPORT, RADIOLOGICAL OBJECT RECOVERY
PARCEL C RADIOLOGICAL CONFIRMATION SAMPLING AND SURVEY
HUNTERS POINT NAVAL SHPYARD, SAN FRANCISCO CA

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2609 North River Road
Port Allen, Louisiana 70767
(225) 372-4748

ARS

Laboratory Analytical Report

ARS1-24-00469

GES-AIS, LLC
Evelyn Dawson
1501 West Fountainhead Parkway
Suite 550
Tempe, AZ 94520
480-212-3768
chemdm-hpns@ges-ais.com, edawson@ges-ais.com, SynecticsDM-HPNS@ges-ais.com

COC Number: **022924WA3301**

PO Number: **J310000600**

Job Location: **Hunters Point Shipyard, Parcel C Removal Site Evaluation**

Questions regarding this analytical report should be addressed to ARS project manager, Abigail Hoover, who can be reached by email at projectmanagers@ars-analytical.com.

I certify that the test results presented in this report (in either hardcopy or electronic file (EDD)) meet the requirements of the laboratory's certifications and other applicable contract terms and conditions. A full list of the Port Allen, LA laboratory's certifications is provided with this report. Any exceptions to the certification or contract will be noted within the case narratives presented in the report. Any subcontracted sample results will be identified within the case narratives presented in the report. In the event this report is an amendment to a previously released report, the case narrative will clearly identify the original report as well as the reason(s) for reissuance. I authorize release and issuance of this report on the date signed below.

Laboratory Management, ARS

Signature

Date

Title

This report provides analytical results of the requested analysis and does not include any opinions or interpretations. ARS assumes no liability for the use or interpretation of analytical results. Results relate only to items tested. A partial reproduction of this test report is prohibited. Reproduction of this report in full requires the written approval of the laboratory.





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Certifications and Accreditations List

State or Accrediting Body (AB)	Certificate Number
AIHA LAP, LLC	209312
California	3085
ANAB DoD	ADE-1489
ANAB DOE	ADE-1489.01
Louisiana DEQ - NELAC	01949
Nevada	LA011312024-04
New Jersey	LA009
New York	68261 (NPW) / 68262 (SHW)
Texas	T104704447-23-19
Utah	LA011312023-14
Washington	C1010

For additional information related to the specific matrices, methods, and analytes recognized by each accrediting body, contact our Quality Assurance Department qa@ars-analytical.com for additional information.

ML-QAM-001-FM-13 r4.1
Revision Date: 02/07/2024



ARS

Analytical Reports

for

GES-AIS, LLC

Case Narrative



2609 North River Road • Port Allen, Louisiana 70767

(225) 372-4748

**PROJECT SAMPLE IDENTIFICATION
CROSS-REFERENCE
TO ARS SAMPLE LABORATORY IDs**

Client Sample ID	ARS Sample ID
HPPC-ESU-315A-RO1	ARS1-24-00469-001

Sample	Date Collected	Date Received	Analysis	Basis	TCLP Date/Time	Prep Date/Time	Analysis Date/Time
001	08/24/23 12:35	03/01/24	GAM-A-SO	As Received		03/01/24 12:36	03/04/24 09:44

SAMPLE RECEIPT/PREP

The samples arrived in good condition. The samples were screened for radioactive contamination as per procedure **PALA-SR-001-SOP Sample Receiving**. Sample date(s) and time(s) are listed as provided by the client. Turnaround time was set at 1 calendar days.

ANALYTICAL METHODS

Am-241, Be-7, Bi-212, Bi-214, Co-60, Cs-134, Cs-137, Ir-192, K-40, Pa-234, Pb-210, Pb-214, Ra-223, Ra-224, Ra-226, Ra-228, Sc-46, Th-228, Tl-208, Tl-210, Total NORM Activity, Total NORM Gamma, U-235, and U-238 analyses were performed using **PALA-RAD-007, "Modified Gamma Emitting Radionuclides in Soil, Air, and Biota Matrices (EPA 901.1 Mod, SM 7120B, & HASL-300 Ga-01-R)"**.

ANALYTICAL RESULTS

ARS1-24-00469: The Method Blank for GAM-A-SO had a detect for Tl-208. All fractions were non-detects, therefore the activity in the Method Blank did not contribute to the concentration in client samples.

Notes (Case Narrative)

Definitions:

CRDL	Contract Required Detection Limit
CSU	Combined Standard Uncertainty
DLC	Decision Level Concentration (ANSI N42.23)
DO	Duplicate Original
DUP	Sample Duplicate
LCS/LCSD	Laboratory Control Sample/Laboratory Control Sample Duplicate
LOD	Limit of Detection
LOQ	Limit of Quantitation
MBL	Method Blank
MCL	Maximum Contaminant Level
MDA	Minimum Detectable Activity
MDL	Method Detection Limit
MS/MSD	Matrix Spike/Matrix Spike Duplicate
N/A	Not Applicable
NC	Not Calculated
NP	Not Provided
NR	Not Referenced
PQL	Practical Quantitation Limit
SDG	Sample Deliverable Group

Data Qualifiers:

B	The result of both the method blank and the target sample are above the MDL.
D	Sample analysis accomplished through dilution.
J	The reported result is an estimated value above the LOD but below the LOQ, or above the MDL but below the PQL.
Q	One or more quality control criteria failed.
U	Result is below the MDA, MDL, PQL, LOD, or LOQ
*	LCS/LCSD or Sample DUP fails all Duplicate criteria.
S	Spike
SC	Subcontracted out to another qualified laboratory.
H	Holding time exceeded
E	Exceeds MCL
**	Reporting Limit is higher than MCL; Target cannot be detected
#	Method/Matrix/Analyte not accredited for this certification

Radiochemistry Comments:

- 1.0) All MDA values are calculated on a sample specific basis.
- 2.0) Data in this report are within the limits of uncertainty specified in the reference method unless otherwise specified.
- 3.0) Total activity is actually total gamma activity and is determined utilizing the prominent gamma emitters from the naturally occurring radioactive decay chains and other prominent radioactive nuclides. Total activity may be lower than the actual total activity due to the extent of secular equilibrium achieved in the various decay chains at the time of analysis. The total activity is not representative of nuclides that emit solely alpha or beta particles.
- 4.0) Ra-226 after a 21-day ingrowth period is determined via secular equilibrium with its daughter, Bismuth 214 (Gamma Spectroscopy only).
- 5.0) Ra-228 is determined via secular equilibrium with its daughter, Actinium 228 (Gamma Spectroscopy only).
- 6.0) U-238 is determined via secular equilibrium with its daughter, Thorium 234 (Gamma Spectroscopy only).
- 7.0) All gamma spectroscopy was performed utilizing high purity germanium detectors (**HPGe**).
- 8.0) ARS makes every attempt to match sample density to calibrated density; however, in some cases, it is not practical or possible to do so and data results may be affected (Gamma Spectroscopy only).
- 9.0) Gamma spectroscopy results are calculated values based on the **ORTEC®** GammaVision ENV32 Analysis Engine.
- 10.0) **DoD/DOE and ISO 17025 certifications through ANAB apply only to the following methods in Non-Potable Water:**
Gross Alpha and Gross Beta (EPA 900.0, EPA 9310); Radium 226 (EPA 903.0, EPA 903.1, EPA 9315); Radium 228 (EPA 904.0, EPA 9320); ICP/MS (EPA 6020B); ICP-OES (EPA 6010D); Mercury CVAA (EPA 7470A); Strontium-89 (EPA 905.0, Eichrom SRW01, HASL 300 Sr-01); Strontium-90 (EPA 905.0, Eichrom SRW01, HASL 300 Sr-02-RC); Tritium (EPA 906.0); Enriched Tritium (ARS-040), Gamma Emitters (EPA 901.1, SM 7120B, HASL 300 Ga-01-R); Americium-241 (Eichrom ACW03, Eichrom ACW16, HASL 300 Se-03, HASL 300 Am-03); Neptunium 237 (Eichrom ACW16); Plutonium 238, Plutonium 239/240, Plutonium-241 (Eichrom ACW03, Eichrom ACW16, HASL 300 Se-03, HASL 300 Pu-10); Thorium-228, Thorium 230, Thorium-232 (Eichrom ACW10); Uranium-234, Uranium-235, Uranium-238 (Eichrom ACW03, Eichrom ACW16, HASL 300 Se-03); Technetium-99 (Eichrom TCW02)
- 11.0) **DoD/DOE and ISO 17025 certifications through ANAB apply only to the following methods in Solid and Chemical Materials:**
Gross Alpha and Gross Beta (EPA 900.0 Mod, EPA 9310); ICP/MS (EPA 6020B); ICP-OES (EPA 6010D); Mercury CVAA (EPA 7471B); Strontium-89 (EPA 905.0 Mod, Eichrom SRW01, HASL 300 Sr-01); Strontium-90 (EPA 905.0 Mod, Eichrom SRW01, HASL 300 Sr-02); Tritium (EPA 906.0 Mod); Gamma Emitters (EPA 901.1, HASL 300 Ga-01-R); Americium-241 (Eichrom ACW03, HASL 300 Se-03, HASL 300 Am-01-RC); Neptunium 237 (Eichrom ACW16); Plutonium 238, Plutonium 239/240, Plutonium-241 (Eichrom ACW03, Eichrom ACW16, HASL 300 Se-03, HASL 300 Pu-02-RC, HASL 300 Pu-03-RC); Thorium-228, Thorium 230, Thorium-232 (Eichrom ACW10); Uranium-234, Uranium-235, Uranium-238 (Eichrom ACW03, Eichrom ACW16, HASL 300 Se-03, HASL 300 U-02, HASL 300 U-04); Technetium-99 (Eichrom TCS01)
- 12.0) **DoD/DOE and ISO 17025 certifications through ANAB apply only to the following methods in Air and Emissions:**
Gross Alpha and Gross Beta (EPA 900.0 Mod, EPA 9310); Strontium-89 (Eichrom SRW01, HASL 300 Sr-01-RC); Strontium-90 (Eichrom SRW01, HASL 300 Sr-02-RC); Gamma Emitters (EPA 901.1, HASL 300 Ga-01-R); Americium-241 (Eichrom ACW03, HASL 300 Se-03); Neptunium 237 (Eichrom ACW16); Plutonium 238, Plutonium 239/240, Plutonium-241 (Eichrom ACW03, Eichrom ACW16, HASL 300 Se-03); Thorium-228, Thorium 230, Thorium-232 (Eichrom ACW10); Uranium-234, Uranium-235, Uranium-238 (Eichrom ACW03, Eichrom ACW16, HASL 300 Se-03); Technetium-99 (Eichrom TCW02, Eichrom TCS01)

General Comments:

- 1.0 Modified analysis procedures are procedures that are modified to meet certain specifications. An example may be the use of a water method to analyze a solid matrix due to the lack of an officially recognized procedure for the analysis of the solid matrix. Modified analyses are indicated by the subsequent addition of "M" or "Mod" to the procedure number (i.e. 901.1M, 901.1 Mod).
- 2.0 All NIOSH method results are reported without blank corrections applied.
- 3.0 Basis: "As Received" = analyzed as received from client; "Dry" = dried prior to being analyzed; "Dry Weight Corrected" = analyzed as received; result corrected for percent moisture.



ARS Analytical Reports

for

GES-AIS, LLC

Analytical Results



2609 North River Road • Port Allen, Louisiana 70767

(225) 372-4748

ARS Sample Delivery Group: ARS1-24-00469

Client Sample ID: HPPC-ESU-315A-RO1

Sample Collection Date: 08/24/23 12:35

Sample Matrix: Soil/Solid/Sludge

Percent Solids: N/A

Request or PO Number: J310000600

ARS Sample ID: ARS1-24-00469-001

Date Received: 03/01/24

Report Date: 03/04/24

Radiochemistry

Analysis Method: EPA 901.1M

ABatch Sample ID: ARS1-B24-00453-04

Analysis Description	Analysis Results	CSU +/- 2 s	MDA	DLC	CRDL	Qual	Analysis Units	Analysis Date/Time	Analysis Technician	Tracer/Chem Recovery
Am-241	-1150.300	8857.600	11700.000	5850.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
Be-7	19027.000	38323.000	63400.000	31700.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
Bi-212	-10136.000	1.165E+5	39800.000	19900.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
Bi-214	2.439E+6	1.491E+5	12400.000	6200.000	NP		pCi/g	03/04/24 9:44	KE	N/A
Co-60	-2730.500	5760.700	5990.000	2995.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
Cs-134	-476.260	5440.100	6080.000	3040.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
Cs-137	-366.480	5106.800	8500.000	4250.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
Ir-192	-1610.900	4264.600	7050.000	3525.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
K-40	-9147.900	77923.000	59500.000	29750.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
Na-22	-3420.600	11347.000	10700.000	5350.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
Pa-234	4309.000	8954.200	11800.000	5900.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
Pb-210	43288.000	95880.000	1.260E+5	63000.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
Pb-212	3932.400	12277.000	20300.000	10150.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
Pb-214	2.390E+6	2.002E+5	15600.000	7800.000	NP		pCi/g	03/04/24 9:44	KE	N/A
Ra-223	-8228.200	33744.000	31600.000	15800.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
Ra-224	4.224E+5	1.323E+5	2.100E+5	1.050E+5	NP		pCi/g	03/04/24 9:44	KE	N/A
Ra-226	2.373E+6	1.817E+5	1.200E+5	60000.000	NP		pCi/g	03/04/24 9:44	KE	N/A
Ra-228	-9780.000	15751.000	28800.000	14400.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
Sc-46	-3120.600	5439.800	6030.000	3015.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
Th-228	3932.400	12277.000	20300.000	10150.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
Th-234	3693.000	63185.000	1.080E+5	54000.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
Tl-208	-990.390	15513.000	6820.000	3410.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
Tl-210	-2254.200	4406.900	4890.000	2445.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
U-235	-13484.000	23669.000	34700.000	17350.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A
U-238	3693.000	63185.000	1.080E+5	54000.000	NP	U	pCi/g	03/04/24 9:44	KE	N/A



ARS Analytical Reports

for

GES-AIS, LLC

Batch QC



QC Results per Analytical Batch

Analytical Batch	ARS1-B24-00453
SDG	ARS1-24-00469
Analysis	Gamma Spec (Short) in (Soil, Sludge, Waste, Sediment, Biota [SO, BI, VG])
Method	EPA 901.1M
Analysis Code	GAM-A-SO
Report Units	pCi/g

Acceptable QC Performance Ranges

QC Sample Type	Performance Items and Ranges		
Laboratory Control Sample	Recovery (%):	> 75	< 125
Matrix Spike	Recovery (%):	> 60	< 140
Duplicate	Duplicate Error Ratio (DER):		< 3
	Relative Percent Difference (RPD %):		≤ 40

Laboratory Control Sample			Analysis Date	03/04/24 09:42	Analysis Technician	KE	
Analysis Batch Sample ID	QC Type	Analyte	Results	CSU (2s)	Expected Value	LCS Rec (%)	MDA
ARS1-B24-00453-01	LCS	AM-241	2.195E+4	1.894E+3	2.275E+4	96.5	527.400
ARS1-B24-00453-01	LCS	CO-60	4.439E+4	2.716E+3	4.279E+4	103.7	607.700
ARS1-B24-00453-01	LCS	CS-137	3.678E+4	2.070E+3	3.545E+4	103.8	237.900

Duplicate RER/DER/RPD		Analysis Date	03/04/24 09:53	Analysis Technician	KE	
Analyte	Results LCS	CSU LCS (2s)	Results LCSD	CSU LCSD (2s)	DER	RPD
AM-241	2.195E+4	1.894E+3	2.230E+4	1.920E+3	0.257	1.6
CO-60	4.439E+4	2.716E+3	4.484E+4	2.763E+3	0.230	1.0
CS-137	3.678E+4	2.070E+3	3.753E+4	2.109E+3	0.493	2.0

Method Blank		Analysis Date	03/01/24 13:18	Analysis Technician	CDW	
Analysis Batch Sample ID	QC Type	Analyte	Results	CSU (2s)	MDA	Qual
ARS1-B24-00453-03	MBL	AM-241	0.013	0.075	0.100	U
ARS1-B24-00453-03	MBL	BE-7	-0.093	0.311	0.376	U
ARS1-B24-00453-03	MBL	BI-212	0.430	0.326	0.635	U
ARS1-B24-00453-03	MBL	BI-214	-0.204	0.955	1.150	U
ARS1-B24-00453-03	MBL	CO-60	0.003	0.040	0.048	U
ARS1-B24-00453-03	MBL	CS-134	0.006	0.030	0.038	U
ARS1-B24-00453-03	MBL	CS-137	0.015	0.057	0.066	U
ARS1-B24-00453-03	MBL	IR-192	-0.010	0.032	0.041	U
ARS1-B24-00453-03	MBL	K-40	0.176	0.499	0.545	U
ARS1-B24-00453-03	MBL	PA-234	-0.068	0.225	0.261	U
ARS1-B24-00453-03	MBL	PB-210	-0.167	2.367	3.980	U
ARS1-B24-00453-03	MBL	PB-214	0.039	0.107	0.130	U
ARS1-B24-00453-03	MBL	RA-223	-0.089	0.194	0.330	U
ARS1-B24-00453-03	MBL	RA-224	-0.182	0.548	0.703	U
ARS1-B24-00453-03	MBL	RA-226	0.243	0.618	0.781	U
ARS1-B24-00453-03	MBL	RA-228	-0.048	0.178	0.203	U
ARS1-B24-00453-03	MBL	SC-46	0.000	0.006	0.049	U
ARS1-B24-00453-03	MBL	TH-228	0.311	1.405	1.890	U
ARS1-B24-00453-03	MBL	TL-208	0.035	0.018	0.017	
ARS1-B24-00453-03	MBL	TL-210	-0.015	0.050	0.057	U
ARS1-B24-00453-03	MBL	U-235	0.057	0.135	0.180	U



QC Results per Analytical Batch

Analytical Batch	ARS1-B24-00453
SDG	ARS1-24-00469
Analysis	Gamma Spec (Short) in (Soil, Sludge, Waste, Sediment, Biota [SO, BI, VG])
Method	EPA 901.1M
Analysis Code	GAM-A-SO
Report Units	pCi/g

Method Blank		Analysis Date	03/01/24 13:18	Analysis Technician	CDW	
Analysis Batch Sample ID	QC Type	Analyte	Results	CSU (2s)	MDA	Qual
ARS1-B24-00453-03	MBL	U-238	0.230	0.505	0.667	U



ARS Analytical Reports

for

GES-AIS, LLC

QC Summary



2609 North River Road • Port Allen, Louisiana 70767
(225) 372-4748

QC Sample Results

Analytical Batch: ARS1-B24-00453

Lab Sample ID: ARS1-B24-00453-01

Method: EPA 901.1M

Sample Type: LCS

Matrix: Soil/Solid/Sludge

Analysis Date: 03/04/24 9:42

Analyte	Spike Added	Analysis Result	Qual	Analysis Units	% Rec	% Rec Limits
Am-241	2.275E+4	2.195E+4		pCi/g	96.5	75 - 125
Co-60	4.279E+4	4.439E+4		pCi/g	103.7	75 - 125
Cs-137	3.545E+4	3.678E+4		pCi/g	103.8	75 - 125



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QC Sample Results

Analytical Batch: ARS1-B24-00453

Lab Sample ID: ARS1-B24-00453-02

Method: EPA 901.1M

Sample Type: LCSD

Matrix: Soil/Solid/Sludge

Analysis Date: 03/04/24 9:53

Analyte	Spike Added	Analysis Result	Qual	Analysis Units	% Rec	% Rec Limits	RPD	RPD Limit	DER	DER Limit
Am-241	2.275E+4	2.230E+4		pCi/g	98.0	75 - 125	1.6	40	0.257	3
Co-60	4.279E+4	4.484E+4		pCi/g	104.8	75 - 125	1.0	40	0.230	3
Cs-137	3.545E+4	3.753E+4		pCi/g	105.9	75 - 125	2.0	40	0.493	3



QC Sample Results

Analytical Batch: ARS1-B24-00453**Lab Sample ID:** ARS1-B24-00453-03**Method:** EPA 901.1M**Sample Type:** MBL**Matrix:** Soil/Solid/Sludge**Analysis Date:** 03/01/24 13:18

Analyte	Analysis Result	CSU +/- 2 s	MDA	DLC	Qual	Analysis Units
Am-241	0.013	0.075	0.100	0.050	U	pCi/g
Be-7	-0.093	0.311	0.376	0.188	U	pCi/g
Bi-212	0.430	0.326	0.635	0.318	U	pCi/g
Bi-214	-0.204	0.955	1.150	0.575	U	pCi/g
Co-60	0.003	0.040	0.048	0.024	U	pCi/g
Cs-134	0.006	0.030	0.038	0.019	U	pCi/g
Cs-137	0.015	0.057	0.066	0.033	U	pCi/g
Ir-192	-0.010	0.032	0.041	0.020	U	pCi/g
K-40	0.176	0.499	0.545	0.273	U	pCi/g
Pa-234	-0.068	0.225	0.261	0.131	U	pCi/g
Pb-210	-0.167	2.367	3.980	1.990	U	pCi/g
Pb-214	0.039	0.107	0.130	0.065	U	pCi/g
Ra-223	-0.089	0.194	0.330	0.165	U	pCi/g
Ra-224	-0.182	0.548	0.703	0.352	U	pCi/g
Ra-226	0.243	0.618	0.781	0.391	U	pCi/g
Ra-228	-0.048	0.178	0.203	0.102	U	pCi/g
Sc-46	0.000	0.006	0.049	0.024	U	pCi/g
Th-228	0.311	1.405	1.890	0.945	U	pCi/g
Tl-208	0.035	0.018	0.017	0.009		pCi/g
Tl-210	-0.015	0.050	0.057	0.028	U	pCi/g
U-235	0.057	0.135	0.180	0.090	U	pCi/g
U-238	0.230	0.505	0.667	0.334	U	pCi/g



2609 North River Road • Port Allen, Louisiana 70767
(225) 372-4748

QC Association Summary

ARS Sample Delivery Group: ARS1-24-00469 **Analytical Batch:** ARS1-B24-00453

Analysis: Gamma Spec (Short) in (Soil, Sludge, Waste, Sediment, Biota [SO, BI, VG])

Batch Sample ID	Lab Sample ID	Client Sample ID	Matrix	Method	Prep Method
ARS1-B24-00453-01		Lab Control Sample	Soil/Solid/Sludge	EPA 901.1M	N/A
ARS1-B24-00453-02		Lab Control Sample Duplicate	Soil/Solid/Sludge	EPA 901.1M	N/A
ARS1-B24-00453-03		Method Blank	Soil/Solid/Sludge	EPA 901.1M	N/A
ARS1-B24-00453-04	ARS1-24-00469-001	HPPC-ESU-315A-RO1	Soil/Solid/Sludge	EPA 901.1M	N/A



Z Values per Analytical Batch

Analytical Batch	ARS1-B24-00453
SDG	ARS1-24-00469
Analysis	Gamma Spec (Short) in (Soil, Sludge,
Analysis Test Method	PALA-RAD-007/EPA 901.1M
Analysis Code	GAM-A-SO
Report Units	pCi/g

Acceptable QC Performance Ranges

QC Sample Type	Performance Items and Ranges
Laboratory Control Sample	ZLCS <= 3
Matrix Spike	ZMS <= 3
Method Blank	ZBLANK <= 3
Duplicate	ZDUP <= 3

Laboratory Control Sample	Analysis Date	03/04/24 09:42	Analysis Technician	KE		
QC Type	Analyte	Results	CSU (1s)	Expected Value	CSU (1s)	Z
LCS	AM-241	2.195E+4	966.071	2.275E+4	682.432	0.676
LCSD	AM-241	2.230E+4	979.439	2.275E+4	682.432	0.374
LCS	CO-60	4.439E+4	1.386E+3	4.279E+4	1.284E+3	0.844
LCSD	CO-60	4.484E+4	1.410E+3	4.279E+4	1.284E+3	1.074
LCS	CS-137	3.678E+4	1.056E+3	3.545E+4	1.064E+3	0.889
LCSD	CS-137	3.753E+4	1.076E+3	3.545E+4	1.064E+3	1.372

Method Blank	Analysis Date	03/01/24 13:18	Analysis Technician	CDW		
QC Type	Analyte	Results	CSU (1s)	Z		
MBL	CS-134	0.006	0.015	0.383		
MBL	CS-137	0.015	0.029	0.509		
MBL	IR-192	-0.010	0.016	0.641		
MBL	K-40	0.176	0.255	0.691		
MBL	PB-210	-0.167	1.208	0.138		
MBL	PB-214	0.039	0.055	0.708		
MBL	PA-234	-0.068	0.115	0.591		
MBL	RA-223	-0.089	0.099	0.898		
MBL	RA-224	-0.182	0.280	0.650		
MBL	RA-226	0.243	0.315	0.770		
MBL	RA-228	-0.048	0.091	0.523		
MBL	SC-46	0.000	0.003	0.000		
MBL	TH-228	0.311	0.717	0.434		
MBL	TL-208	0.035	0.009	3.767		
MBL	TL-210	-0.015	0.026	0.591		
MBL	U-235	0.057	0.069	0.824		
MBL	U-238	0.230	0.257	0.894		
MBL	BI-212	0.430	0.166	2.584		
MBL	BI-214	-0.204	0.487	0.420		
MBL	CO-60	0.003	0.021	0.163		
MBL	AM-241	0.013	0.038	0.341		



Z Values per Analytical Batch

Analytical Batch	ARS1-B24-00453
SDG	ARS1-24-00469
Analysis	Gamma Spec (Short) in (Soil, Sludge,
Analysis Test Method	PALA-RAD-007/EPA 901.1M
Analysis Code	GAM-A-SO
Report Units	pCi/g

Method Blank	Analysis Date	03/01/24 13:18	Analysis Technician	CDW
QC Type	Analyte	Results	CSU (1s)	Z
MBL	BE-7	-0.093	0.159	0.586

Duplicate Sample	Analysis Date	03/04/24 09:53	Analysis Technician	KE		
QC Type	Analyte	Results Dup	CSU (1s)	Results DO	CSU (1s)	Z
LCSD	AM-241	2.230E+4	979.439	2.195E+4	966.071	0.257
LCSD	CO-60	4.484E+4	1.410E+3	4.439E+4	1.386E+3	0.230
LCSD	CS-137	3.753E+4	1.076E+3	3.678E+4	1.056E+3	0.493



ARS Analytical Reports

for

GES-AIS, LLC

Sample Management Records

CHAIN-OF-CUSTODY RECORD

Gilbane Federal
Brett Womack
1501 W Fountainhead Parkway, Suite 550, Tempe, Arizona 85282
bwomack@ges-ais.com

COC # 022924WA3301



Project: Hunters Point Shipyard, Parcel C Removal Site Evaluation	Laboratory: ARS Aleut Analytical (AAA), Port Allen, LA
Project Number: J310000600	Point of Contact: Keith Greene Keith.Greene@aaa.aieuffederal.com
WBS Code: J310000600	Ship to: 2609 North River Road, Port Allen, LA 70767-3469

Analytical Test Method

Comments: 1,348,930 CPM/Contact

16,161 CPM @ 30cm

1,200 42,000 uR/hr Contact
mjb
2/29/23

32 uR/hr @ 30cm

Level 2 Reporting. Only hard-copy required.

Library
E901.1 - Gamma Spec - Full

Work Area 33 Phase 1

Sample ID	Matrix	Date	Time	Samp Init.	Location ID	Sample Type	Depth (ft bgs)
1	HPPC-ESU-315A-RO1	8/24/23	12:35 PST		HPPC-ESU-315A		Top - Bottom
2							
3							
4							
5							
6							
7							
8							
9							
10							

Turn Around Time:

Cooler:

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
<i>[Signature]</i>	02/29/24	1630	FedEx	02/29/24	1630

Shipping Date / Carrier / Airbill Number	02/29/24 7153 7350 9790
Received by Laboratory: (Signature, Date, Time) & condition	<i>[Signature]</i> 3-1-24/730

ARS
Port Allen LaboratoryPrinted: 3/4/2024 11:52 AM
Page 1 of 2**SDG Report - Samples and Containers****SDG Specific Data**

SDG	ARS1-24-00469			TAT Days	1 Calendar Days	Project Type	Environmental
Sample Count	1	Rpt Level	2a	Date Received	03/01/2024	COC Number	022924WA3301
Client	GES-AIS, LLC			Discrepancy Resol	N/A	PO Number	J310000600
Client Code	1138			Client Deadline	03/04/2024	Job Number	Hunters Point Shipyard, Parcel C Removal Site Evaluation
Profile Number	PN-01440					Job Location	
Comment							

Samples and Containers Checked In Thus Far

FR	Name	Matrix	Start Date	End Date	Disp	Hold	Arch	Storage	Comments
001	HPPC-ESU-315A-RO1	Soil/Sol id/Slud ge	08/24/2023 12:35	08/24/2023 12:35	R	30	10	PrePrep	
	IC_ID	Cnt	Container Type	Container Size	pH Orig	pH Final	Temp (C)		Comments
	455935	1	Other	N/A					1,200 ur/hr on contact

ARS
Port Allen Laboratory

Printed: 3/4/2024 11:52 AM
Page 2 of 2

SDG Report - Analysis Assignments

SDG	ARS1-24-00469	Sample Count	1
Client	GES-AIS, LLC	Analysis Count	1-1

Sample Count Totals Per Analysis			
Analysis Code	Analysis Description	In/Out	Samples Count
GAM-A-SO	Gamma Spec (Short) in (Soil, Sludge, Waste, Sediment,Biota [SO, BI, VG])	I	1

Analyses Assigned Per Fraction		
Fraction	Analysis Code	X = Assigned
001	GAM-A-SO	X

ARS1-24-00469

Report Level: 2a

Analysis Code	Prep Type	Units	Aliquot	Prep Code	Procedure	Count Time					
GAM-A-SO	WGAM	pCi	g	N/A	PALA-RAD-007						
	Analyte			RDL	LCS LL/UL	MS LL/UL	RadY LL/UL	GravY LL/UL	RER	RPD	Surr LL/UL
	Am-241 (14596-10-2)			0.7 pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Be-7 (13966-02-4)			pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Bi-212 (14913-49-6)			pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Bi-214 (14733-03-0)			pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Co-60 (10198-40-0)			0.1 pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Cs-134 (13967-70-9)			pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Cs-137 (10045-97-3)			0.07 pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Ir-192 (14694-69-0)			pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	K-40 (13966-00-2)			pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Pb-210 (14255-04-0)			pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Pb-214 (15067-28-4)			pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Ra-223 (15623-45-7)			pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Ra-224 (13233-32-4)			pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Ra-226 (13982-63-3)			1 pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Ra-228 (15262-20-1)			5 pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Sc-46 (13967-63-0)			pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Th-228 (14274-82-9)			pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Tl-208 (14913-50-9)			pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Tl-210			pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	U-235 (15117-96-1)			pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	U-238 (7440-61-1)			pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Pa-234 (15100-28-4)			pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Total NORM Activity			pCi/g	75/125	60/140	30/110	40/110	1	40	N/A
	Total NORM Gamma			pCi/g	75/125	60/140	30/110	40/110	1	40	N/A

DQO Report for SDG

ARS1-24-00469

Analysis Code	Fraction	Units	Aliquot	Conductivity	Analyte Count
GAM-A-SO	001	pCi	g	N/A	24
		Group		Analyte	
		NORM + AM + CS + CO		Am-241	
		NORM + AM + CS + CO		Be-7	
		NORM + AM + CS + CO		Bi-212	
		NORM + AM + CS + CO		Bi-214	
		NORM + AM + CS + CO		Co-60	
		NORM + AM + CS + CO		Cs-134	
		NORM + AM + CS + CO		Cs-137	
		NORM + AM + CS + CO		Ir-192	
		NORM + AM + CS + CO		K-40	
		NORM + AM + CS + CO		Pa-234	
		NORM + AM + CS + CO		Pb-210	
		NORM + AM + CS + CO		Pb-214	
		NORM + AM + CS + CO		Ra-223	
		NORM + AM + CS + CO		Ra-224	
		NORM + AM + CS + CO		Ra-226	
		NORM + AM + CS + CO		Ra-228	
		NORM + AM + CS + CO		Sc-46	
		NORM + AM + CS + CO		Th-228	
		NORM + AM + CS + CO		Tl-208	
		NORM + AM + CS + CO		Tl-210	
		NORM + AM + CS + CO		Total NORM Activity	
		NORM + AM + CS + CO		Total NORM Gamma	
		NORM + AM + CS + CO		U-235	
		NORM + AM + CS + CO		U-238	

Client Name: GGSSDG: ARS1-24-00469

Sample Custodian: Jacqui Survey Start Date: 3-1-24 Survey Start Time: 9:45
 Thermometer ID: E1054012261 Calibration Due Date: 12-27-24 pH Paper Lot# 92110
 Exposure Rate Meter + Probe Unit ID: 104861 Calibration Due Date: 3-21-24 Background: 5 μ R/hr
 Count Rate Meter + Probe Unit ID: 330343 Calibration Due Date: 3-21-24 Background: 40 cpm
 Delivery Type (circle one): Direct Lock Box Commercial Carrier FDL Total # of ESCs: 1

*True temperature is recorded which includes any applicable correction factors.

External Shipping Container Tracking:	Exposure Rate (μ R/hr) (limit <500 μ R/hr)	Max External Swipe Counts (cpm)	Max Internal Swipe Counts (cpm)	ESC True Temps* ($^{\circ}$ C)	TRAX Matrix ID (circle all that apply): (See Section 4.3 of SOP)
A: <u>775373509790</u>	<u>5</u>	<u>40</u>	<u>40</u>	<u>-</u>	AQ WD WG WO
B: _____	_____	_____	_____	_____	WS WW SI UR
C: _____	_____	_____	_____	_____	<u>SO</u> OL BI VG
D: _____	_____	_____	_____	_____	WP SM AF
E: _____	_____	_____	_____	_____	
F: _____	_____	_____	_____	_____	

Visual Inspection: (Circle response)

External Shipping Container

Good Condition with no Leaks or Tears Yes No
 Marked Radioactive Yes No
 UN2910 Yes No
 Security Seals Yes No
 If yes, intact? Yes No N/A

Internal Shipping Container

COC's Present Yes No
 Well packaged container with no signs of leakage Yes No

Comments:

COC/Sample Inspection

(Circle response)

Sample Containers in good condition Yes No
 No spills or leaks Yes No
 Marked Radioactive Yes No
 Durable labels w/indelible ink Yes No
 COC relinquished/received correctly Yes No
 Adequate volume/filled correctly Yes No
 Hold Time sufficient for analysis Yes No
 For VOC/Radon, Head space? Yes No N/A
 If yes, <6mm? Yes No N/A
 # of containers received matches # on COC Yes No
 Samples received on ice? Yes No
 Type (circle one): Bagged Ice Loose Ice Blue Ice N/A

SDG: ARJ-24-00469

Tip Lot#:

pH <2 is Acceptable

Acceptance Limits
<100 cpm/cm ²

[illegible]

Survey/pH End Time: 4:50

NOTE: Any metals sample acidified at sample receiving must be re-checked after a 24 hour hold.

Analyst: _____ pH strip lot #: _____

**If no, complete and send to Project Management:*

1. Section A of PALA-SR-001-FM-05 (24 Hour Hold pH Readjustment)
2. SR section of PALA-SR-001-FM-03 (Discrepant Sample Receipt Report).

ORIGIN ID: JCCA (925) 586-5968 ANDREW ALEXANDER GES-AIS 200 FISCHER AVE SAN FRANCISCO, CA 94124 UNITED STATES US		SHIP DATE: 29FEB24 ACTWGT: 5.00 LB CAD: 254128867/NET 4700 DIMS: 12x12x10 IN BILL SENDER
TO KEITH GREENE ARS ALEUT ANALYTICAL, LLC 2609 NORTH RIVER ROAD PORT ALLEN LA 70767 (225) 381-2991 INV. REF: J310000600 PO. DEPT.		
 		
TRK# 7753 7350 9790 0201	FRI - 01 MAR 5:00P STANDARD OVERNIGHT	XN OPLA LA-US 70767 MSY
		

583J6/194B/9AE3

After printing this label:

1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2. Fold the printed page along the horizontal line.
3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

Warning: Use only the printed original label for shipping. Using a photocopy of this label for shipping purposes is fraudulent and could result in additional billing charges, along with the cancellation of your FedEx account number.

Use of this system constitutes your agreement to the service conditions in the current FedEx Service Guide, available on fedex.com. FedEx will not be responsible for any claim in excess of \$100 per package, whether the result of loss, damage, delay, non-delivery, misdelivery, or misinformation, unless you declare a higher value, pay an additional charge, document your actual loss and file a timely claim. Limitations found in the current FedEx Service Guide apply. Your right to recover from FedEx for any loss, including intrinsic value of the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental, consequential, or special is limited to the greater of \$100 or the authorized declared value. Recovery cannot exceed actual documented loss. Maximum for items of extraordinary value is \$1,000, e.g. jewelry, precious metals, negotiable instruments and other items listed in our Service Guide. Written claims must be filed within strict time limits, see current FedEx Service Guide.

Discrepant Sample Receipt Report

For Sample Receiving Use

SDG: ARS1-24-00469 Receipt Date/Time: 3-1-24 1930 Matrix: SCClient Name: GES-AIS

Problem Description:

No collection time

For Project Manager Use

Client Notified ☒ (Y) ☐ (N): _____ Date/Time Client Notified: 3-1-24 1103Z

Client/PM Resolution:

emailed Matt + Andy
revised chain sent by MattClient Notified that TAT Starts from Resolution of DSRR ☒ (Y) ☐ (N): _____Date/Time DSRR Resolved: 3-1-24 1301 PM Initials: SAL

For Sample Receiving Use

Action Taken:

Scan revised chain into Tray

Signature: _____

Sample Custodian

Date/Time: 3-1-24 1305